2013 – 39th Avenue NE Calgary, Alberta, T2E 6R7

BELL 212, 412, 205A-1, 205B

ROTORCRAFT FLIGHT MANUAL SUPPLEMENT

for the

INSTALLATION of RAPPEL MOUNT PROVISION

Limited Supplemental Type Certificate No. C-LSH08-157/D

Sections 1, 2, 3 and 4 of this document comprise the Transport Canada Approved sections of this Flight Manual Supplement. Compliance with Section 1, Limitations, is mandatory.

Section 5 and any subsequent sections if present are Unapproved and are provided for information only.

The information and data contained in this Flight Manual Supplement supersede or supplement that contained in the basic Approved Flight Manual for the 212 and 205A-1 when fitted with the Rappel Mount Provision. For limitations, procedures and performance not listed in this Flight Manual Supplement, refer to the Approved Flight Manual and other approved Flight Manual Supplements.

Transports

Canada

APPROVED

AIRCRAFT CERTIFICATION

Transport Canada

Approval Date 2008-05-07 YY - MM - DD

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TRANSPORT CANADA APPROVED

AERO DESIGN LTD.

FMS758.90

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1 LIMITATIONS

1-3 TYPES OF OPERATIONS:

The Rappel Mount Provision is an approved provision for rappel operations only.

Rappel operations permitted during VFR conditions only.

1-4 FLIGHT CREW:

Rappel Operations:

A second crewman is required as a Rappel Operations Load Master if rappel operations are to be conducted. The crewman must have full access of the cabin to perform duties as a Rappel Operations Load Master.

Rappellers may be present as passengers essential to the operation. The Rappellers must have full access of the passenger area within the cabin to perform duties as a Rappel Crew Member.

All Rappel Crew Members are to be directed by the Rappel Operations Load Master.

The Rappel Operations Load Master and all Rappel Crew Members must wear a protective helmet for moving about in the aircraft.

Carriage of Passengers during non-rappel flights:

All passengers must remain seated with the seatbelt fastened during flight.

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1-5 CONFIGURATION:

The aircraft may be equipped with:

A Left Hand Rappel Mount Provision,

A Right Hand Rappel Mount Provision, or

Both Left Hand and Right Hand Rappel Mount Provisions.

1-5-A REQUIRED EQUIPMENT FOR RAPPEL OPERATIONS:

The aircraft must have a functioning communications system betweent the pilot and the load master.

A hook knife must be;

- Carried by the Rappel Operations Load Master for immediate access, or
- Fixed within the helicopter interior, readily accessible to the Rappel Operations Load Master, as detail by the operating agency's operating procedures.

1-7 AIRSPEED

Rappel Operations: Hover with lateral translation at a speed not to exceed 10 knots is permitted for positioning only.

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1-20 MARKINGS AND PLACARDS

Placards 75801-11 and 75801-12 to be in clear view of the pilot

AIRCRAFT MUST BE IN HOVER FOR RAPPEL OPERATIONS

Placard 75801-11

RAPPEL OPERATIONS DURING VFR CONDITIONS ONLY

Placard 75801-12

Placard 75801-13 to be attached to Rappel Mount Provision in clear view of the load master.

MAXIMUM RAPPEL MOUNT CAPACITY 350 LBS (158 KG)

Placard 75801-13

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2 NORMAL PROCEDURES

2-1 INTRODUCTION:

The Rappel Mount Provision is approved for rappel operations only. A rappel operation is the continuous controlled decent of a single person (the rappeller) from the aircraft to the ground. The rappeller descends on a rope fixed to the Rappel Mount Provision and controls the decent.

This section contains instructions for conducting rappel operations.



INTENTIONALLY STOPPING THE DECENT PRIOR TO REACHING THE GROUND IS NOT PERMITTED



USING THE RAPPEL MOUNT PROVISION FOR EXTRACTIONS IS NOT PERMITTED.

2-3 PREFLIGHT CHECK:

Visually inspect the Rappel Mount Provision for loose fasteners and wear.

Ensure the roof and floor fittings are properly in position and locked.

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2-9 IN FLIGHT OPERATIONS - RAPPEL OPERATIONS:

Ensure communication between the pilot and the load master is established and maintained.



STOP RAPPEL OPERATIONS IF COMMUNICATION BETWEEN THE PILOT AND THE LOAD MASTER HAS FAILED

Rappel operations may commence only on the pilot's command

Rappel operations must stop on the pilot's command.

The aircraft must be in hover flight during rappel operations

The aircraft must maintain an altitude that ensures the rappel line is in contact with the ground.

The rappel rope must be dropped to the ground when the rappel operation is complete. Do not retract the rappel line into the aircraft.

The load master must observe the rappel operation and communicate to the pilot the status of the rappel operation continuously.

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3 EMERGENCY PROCEDURES

Suspension line jettisonability lies within the direct control of the load master under the pilots command. Clear communication between the pilot and the load master must be maintained during rappel operations.

SUSPENSION LINE JETTISON PROCEDURE

On the command of the pilot the load master must jettison the suspension line by:

- i. Releasing the suspension line, or
- ii. Cutting the line with the hook knife provided for the Rappel Operations Load Master.



THE SUSPENSION LINE MUST BE CUT AS SHORT AS PRACTICAL.

ANY LOOSE LINE REMAINING MUST BE IMMEDIATELY SECURED TO PREVENT ANY POSSIBLE ENTANGLEMENT WITH THE HELICOPTER ROTOR SYSTEM.

4 PERFORMANCE

No change from basic Rotorcraft Flight Manual.

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5 WEIGHT AND BALANCE

English Units		Long	itudinal	Lateral		
Item	Weight	Arm	Moment	Arm	Moment	
item	(Lb)	(in)	(in*Lb)	(in)	(in*Lb)	
Left Hand Rappel Mount Provision (If Installed)	7.63	120.4	918.6	-39.5	-301.4	
Right Hand Rappel Mount Provision (If Installed)	7.63	120.4	918.6	39.5	301.4	

Metric Units		Long	gitudinal	Lateral	
Item	Weight (kg)	Arm (m)	Moment (kg*m)	Arm (m)	Moment (kg*m)
Left Hand Rappel Mount Provision (If Installed)	3.5	3.06	10.71	-1.00	-3.5
Right Hand Rappel Mount Provision (If Installed)	3.5	3.06	10.71	1.00	3.5

Note:

A rappeller suspended from the Rappel Mount Provision is located at Fuselage Station 113in and Right Butt Line 50in (for Right Hand Rappel Mount Provision) and/or Left Butt Line -50in (for Left Hand Rappel Mount Provision).

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Department of Transport

Limited Supplemental Type Certificate

This approval is issued to: Number: C-LSH08-157/D

AERO Design Ltd. Issue No.: 1

2013 39th Avenue NE Approval Date: 14 May 2008
Calgary, Alberta Issue Date: 14 May 2008

Canada T2E 6R7

Responsible Office: Prairie and Northern

Aircraft/Engine Type or Model: BELL 212

Registration/Serial No.: C-GALI/30525, C-FAHZ/30562, C-FAHL/30588,

C-GIRZ/30622, C-GAHV/30699, C-FAHR/30789, C-FAHB/30794, C-FALV/30816, C-FAHK/30852, C-FAHP/30933, C-GAHO/30937, C-FAHG/30940, C-FALK/30982, C-GRNR/30999, C-FAHC/31246

Canadian Type Certificate or Equivalent: H-86

Description of Type Design Change: Rappel Mount Provision and Cargo Deployment Arm

Installation/Operating Data,

Required Equipment and Limitations :

Configuration A - Rappel Mount Provision Installation Only:

Installation of the Rappel Mount Provision to be completed in accordance with Transport Canada approved, AERO Design Ltd. Document Control List, DCL758-1, Revision 0, dated 07 May 2008, or later approved revision.

Transport Canada approved, AERO Design Ltd. Flight Manual Supplement FMS758.90, Revision 1, dated 07 May, 2008, or later approved revision is required with this installation.

Configuration B - Rappel Mount Provision Installation with Cargo Deployment Arm Installation: Installation of the Rappel Mount Provision and Cargo Deployment Arm to be completed in accordance with Transport Canada approved, AERO Design Ltd. Document Control List, DCL758-1, Revision 0, dated 07 May 2008, and Transport Canada approved, AERO Design Ltd. Document Control List, DCL792-1, Revision 0, dated 07 May 2008, or later approved revisions.



Conditions: This approval is only applicable to the type/model of aeronautical product specified therein. Prior to incorporating this modification, the installer shall establish that the interrelationship between this change and any other modification(s) incorporated **will not** adversely affect the airworthiness of the modified product.

E. Burgoin, DAR 290M For Minister of Transport



TRANSFER REQUEST

INSTRUCTIONS

A transfer of ownership requires a prior approval from the Minister

The reissue of the certificate in the name of the transferee will be contingent upon a demonstration made by the new owner that he can fulfill the responsibilities of an approval holder. Refer to AMA 513/5 for further details.

EQUEST FOR TRANSFER OF OWNERSHIP - LIMIT	TED SUPPLEMENTAL TYPE CERTIFICATE OF REPAIR DESIGN CERTIFICA
ROM (NAME AND ADDRESS OF HOLDER)	
(NAME AND ADDRESS OF TRANSFEREE)	
(IAME MAD ADDRESS OF TAMES ENDE)	
RANSFER PARTICULARS (LICENSE AGREEMENT	1
LE OF RIGHTS, ETC.)	
ATE TRANSFER REQUIRED:	
	SIGNATURE (OF ORIGINAL OWNER)

(Continuation Sheet)

Number: C-LSH08-157/D Issue 1

NOTE: THIS ADDENDUM SHALL REMAIN PART OF THE CERTIFICATE REFERRED TO THEREIN.

Transport Canada approved, AERO Design Ltd. Flight Manual Supplement FMS758.90, Revision 1, dated 07 May, 2008, and Transport Canada approved, AERO Design Ltd. Flight Manual Supplement FMS792.90, Revision 1, dated 07 May, 2008, or later approved revision is required with this installation

Configuration A and B

Optional Equipment - Rappel Step Installation:

Installation of the Rappel Step to be completed in accordance with Transport Canada approved, AERO Design Ltd. Document Control List, DCL798-1, Revision 0, dated 14 May 2008.

The Rappel Step is optional and is not required with installation of Configuration A and B.

Rappel Step installed in accordance with DCL798-1 may remain installed if Configuration A and B are removed.

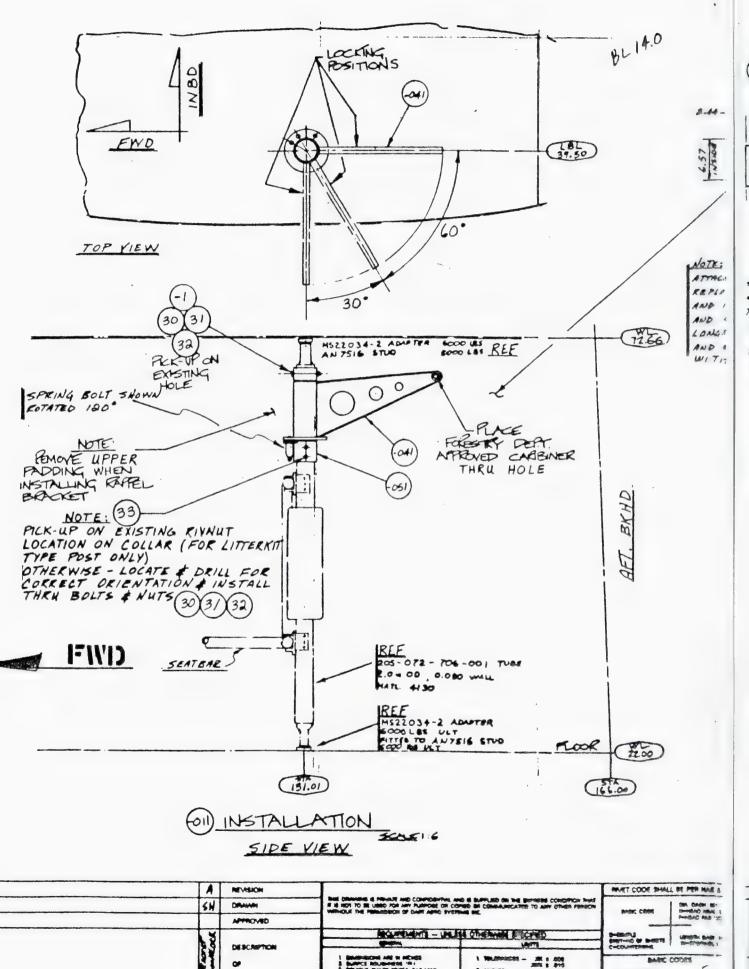
Data Pertinent to All Configurations:

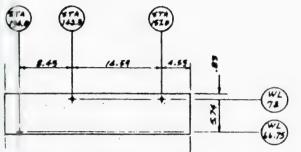
Transport Canada accepted, AERO Design Ltd. Instructions for Continued Airworthiness ICA758.90, Revision 0, dated 07 May, 2008, or later accepted revision is required with this installation.

Basis of Certification for installation is FAR 29 at amendment 29-2 and amendment 29-43 for 29.865(a) and 29.865(e).

- End -







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NOTES

- 51 ALL MATERIAL, PARTS & COMPONENTS MUST MEET REQUIREMENTS OF EAT MANUAL PARTI, PARAGRAPH 3.1.2.
- 52 WORKMANGHIP MUST BE TO REQUIREMENTS OF EXT MINUAL; AC43.13.14 FZA.
- 53. WELD IN ACCORDANCE WITH MIL-W-5604
- 54 REMOVE RUST & SCALE, PRIME AND PAINT TO MATCH EXISTING POST.

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		E OF AIRC	ISPORT RAFT OR AIRCRAFT IESS REQUIREMENTS	AE-100 No.: Initial Issue Date: Revision:	AE75 07 Ma	8-2 ay, 2008
Aircraft Mfgr: Aircraft Model: Registration:	ircraft Model: 212, 412, 205A-1, 205B		Model Type Airplane	Revision Date: Approval No.: Delegation No.: Delegate Name: Classification of Designee: Employer:	C-LSH08-157/D 290M E. Burgoin	
		LI	ST OF APPROVED REPO	RTS AND DATA		
Document	t Number		Docun	nent Title		Compliance Status
DCL758-1 75801 DCL758-2						
75820 75824 75825 75826 75830 75831 75832 75833 75834 75835 75836	Revision 0	Assembly Assembly Tube Retainer Guide Stanchion Curved V Gate Par Bearing (ts			
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DOCUMENT NO.	DOCUN	MENT CONTENT	REVISION
INSTALLATION DOCUMENTS			
75801	Rappel Mount Provisi	ion Installation	0
ICA758.90	Instructions for Contin	nued Airworthiness	0
FMS758.90	Flight Manual Supple	ment	1
FABRICATION DOCUMENTS			
DCL758-2	Document Control Lis Assembly	st – Rappel Mount Provision	0
ENGINEERING DOCUMENTS			
APPROVAL: Transport Canada E BURGOIN Discussions	ORIGINAL DATE: 07 May 2008 REVISION DATE:	AERO DESIC 2013 – 39 th Ave NE, Calgary, Ph. (403) 250-8 Fax. (403) 250-8	Alberta, T2E 6R7 3027
Transport Canada E SURGOIN	07 May 2008	2013 – 39 th Ave NE, Calgary, Ph. (403) 250-8	Alberta, T2E 6R7 3027 83333 5A-1, 205B Provision

DOCUMENT NO.	DOCUM	MENT CONTENT	REVISION
INSTALLATION DOCUMENTS			
FABRICATION DOCUMENTS			
75820	Rappel Mount Assem	nbly	0
7582 4 75825 75826	Assembly, Plug, STN Assembly, Plug, Guid Assembly, Plug, 131		0 0 0
75830 75831 75832 75833 75834 75835 75836	Tube Retainer Guide Stanchion Adapter Curved Washer Gate Parts Bearing Clip		0 0 0 0 0 0
ENGINEERING DOCUMENTS ER758.01	Engineering Report		0
APPROVAL: Mensylen Caesada E. B. ARCANINA A.A.B.S. S. O. U.S.	ORIGINAL DATE: 07 May 2008 REVISION DATE:	AERO DES 2013 – 39 th Ave NE, Calga Ph. (403) 25 Fax. (403) 25	ry, Alberta, T2E 6R7 0-8027
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15500 No. 14 MAY 2008	DC	L758-2	Rev.

		E OF AIRC RWORTHIN AA-1, AHR, AHB, ALV, AHK, AHP, FAHG, RNR,	Airplane Helicopter Appliance Component	Revision: 1 27 May Approval No.: C-LSH0 Delegation No.: Delegate Name: Classification of Designee: Employer: AERO D			ay, 2008 ay 2008 H08-157/D
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DCL758-2 75820 75824 75825 75826 75830 75831 75832 75833 75834 75835 75836 ER758.01	Revision 1 Revision 0 Revision 1 Revision 1 Revision 0	Rappel M Assembly Assembly Assembly Tube Retainer Guide Stanchior Curved W Gate Parl Bearing C	Vasher ts				CP758-1 Rev 0
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DOCUMENT NO.	DOCU	MENT CONTENT	REVISION		
INSTALLATION DOCUMENTS					
75801	Rappel Mount Provis	ion Installation	0		
ICA758.90	Instructions for Conti	Instructions for Continued Airworthiness			
FMS758.90	Flight Manual Supple	ement	1		
FABRICATION DOCUMENTS					
DCL758-2	Document Control Li Assembly	st – Rappel Mount Provision	1		
ENGINEERING DOCUMENTS					
APPROVAL:	ORIGINAL DATE: 07 May 2008 REVISION DATE: 27 May 2008	AERO DES 2013 – 39 th Ave NE, Calo Ph. (403) 2 Fax. (403) 3	gary, Alberta, T2E 6R7 250-8027		
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INSTALLATION DOCUMENTS			
FABRICATION DOCUMENTS			
75820	Rappel Mount Asser	nbly	0
75824 75825 75826	Assembly, Plug, STI Assembly, Plug, Gui Assembly, Plug, 131	1 1 1	
75830 75831 75832 75833 75834 75835 75836	Tube Retainer Guide Stanchion Adapter Curved Washer Gate Parts Bearing Clip		0 0 0 0 0 0
ENGINEERING DOCUMENTS ER758.01	Engineering Report		0
APPROVAL:	ORIGINAL DATE: 07 May 2008 REVISION DATE: 27 May 2008	AERO DESIGI 2013 – 39 th Ave NE, Calgary, A Ph. (403) 250-802 Fax. (403) 250-83	lberta, T2E 6R7 27
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		E OF AIRC	NSPORT PRAFT OR AIRCRAFT IESS REQUIREMENTS	AE-100 No.: Initial Issue Date: Revision:	07 M	ay, 2008
Aircraft Mfgr: Aircraft Model: Registration:	Bell 212, 412, 205 205B C-GALI, C-FA C-FAHL, C-F, C-GIRZ, C-FA C-GAHV, C-F C-GAHO, C-F C-FALK, C-G C-FALK, C-G	AHR, AHB, ALV, AHK, FAHP, FAHG,	Model Type Airplane Helicopter Appliance Component	Revision Date Approval No Delegation No Delegate Name Classification of Designee Employer	290N	
		LI	ST OF APPROVED REP	ORTS AND DATA		
Document	Number		Doc	ument Title		Compliance Status
DCL758-1 75801	Revision 2 Revision 0		nt Control List Iount Provision Installatio	n		As per Compliance CP758-1 Rev 0
DCL758-2 75820 75824 75825 75826 75830 75831 75832 75833 75834 75835 75836 ER758.01	Revision 1 Revision 0 Revision 1 Revision 1 Revision 0	Rappel M Assembly Assembly Tube Retainer Guide Stanchior Curved W Gate Parl Bearing C	Vasher ts			
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DOCUMENT NO.	DOCU	MENT CONTENT	REVISION
INSTALLATION DOCUMENTS			
75801	Rappel Mount Provi	sion Installation	0
ICA758.90	Instructions for Cont	inued Airworthiness	1
FMS758.90	Flight Manual Suppl	ement	1
FABRICATION DOCUMENTS			
DCL758-2	Document Control L Assembly	ist – Rappel Mount Provision	1
ENGINEERING DOCUMENTS			
APPROVAL Fant port Canada E BURCOIN FANT JO V E D	DRIGINAL DATE: 07 May 2008 REVISION DATE: 16 June 2008	AERO DESIG 2013 – 39 th Ave NE, Calgary, Ph. (403) 250-8 Fax. (403) 250-8	Alberta, T2E 6R7 027
Appr. No.C-L5/100 -157/10 Appr. No.C-L5/100 -157/10	SHEET 1 OF 1	Bell 212, 412, 205 Rappel Mount P Installatio	rovision
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		E OF AIRC	ISPORT RAFT OR AIRCRAFT IESS REQUIREMENTS	AE-100 No.: Initial Issue Date: Revision:	C-LSH08-157/D 290M E. Burgoin	
Aircraft Mfgr: Aircraft Model: Registration:	Bell 212, 412, 205 205B C-GALI, C-FA C-FAHZ, C-FA C-GIRZ, C-FA C-GAHV, C-F C-GAHO, C-F C-FALK, C-G C-FAHC	AHR, AHB, ALV, AHK, FAHP, FAHG,	Model Type Airplane Helicopter Appliance Component	Revision Date: Approval No.: Delegation No.: Delegate Name: Classification of Designee: Employer:		
725		LI	ST OF APPROVED REP	ORTS AND DATA		
Document	Number		Docu	ment Title		Compliance Status
DCL792-1 79201	Revision 0 Revision 0		nt Control List eployment Arm Installation		As per Compliance CP758-2 Rev 0	
79220 79230 79231 79232 79233 79234 79235 79236 79237	Revision 0	Cargo De Cargo Ari Bearing S Cover Bushing Sleeve Lock Lea Bushing Bushings	Sleeve			
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DOCUMENT NO.	DOCUM	MENT CONTENT	REVISION
INSTALLATION DOCUMENTS			
79201	Cargo Deployment A	rm Installation	0
ICA758.90 FMS792.90	Instructions for Conti Flight Manual Supple		0
FABRICATION DOCUMENTS			
DCL792-2	Document Control Lis	0	
ENGINEERING DOCUMENTS			
APPROVAL: Iransported a E. BUFGOIN DAR 25 M	ORIGINAL DATE: 07 May 2008 REVISION DATE:	AERO DES 2013 – 39 th Ave NE, Calga Ph. (403) 250 Fax. (403) 25	ry, Alberta, T2E 6R7 0-8027
Applitus & 45 H 08-157/D Applitus & 45 H 08-157/D	SHEET 1 OF 1	Bell 212, 412, 205A-1, 205B Cargo Deployment Arm Installation	
Source In 14 MAY 2008	DC	L792-1	Rev.

DOCUMENT NO.	DOCUI	MENT CONTENT	REVISION	
INSTALLATION DOCUMENTS				
FABRICATION DOCUMENTS				
79220	Cargo Deployment A	rm Assembly	0	
79230 79231 79232 79233 79234 79235 79236 79237	Cargo Arm Bearing Sleeve Cover Bushing Sleeve Lock Leaver Bushing Bushings		0 0 0 0 0 0	
ENGINEERING DOCUMENTS ER758.01	Engineering Report		0	
APPROVAL:	ORIGINAL DATE: 07 May 2008 REVISION DATE:	AERO DESIO 2013 – 39 th Ave NE, Calgary Ph. (403) 250-4 Fax. (403) 250-	, Alberta, T2E 6R7 3027	
Appril Date 14 Ligy 2008	SHEET 1 OF 1	Bell 212, 412, 205A-1, 205B Cargo Deployment Arm Assembly		
Issue No. 19 MAY LOB	DC	L792-2	Rev.	

STATEMENT O COMPONENTS		E OF AIRC	AE-100 No.: Initial Issue Date: Revision:	AE758-3 07 May, 2008		
Aircraft Mfgr: Aircraft Model: Registration:	Bell 212, 412, 205 205B C-GALI, C-FA C-FAHZ, C-F C-GIRZ, C-FA C-GAHV, C-F C-GAHO, C-F C-FALK, C-G C-FALK, C-G C-FAHC	NHR, AHB, ALV, NHK, TAHP, TAHG,	Model Type Airplane Helicopter Appliance Component	Revision Date: Approval No.: Delegation No.: Delegate Name: Classification of Designee: Employer:	27 May 2008 C-LSH08-157/D 290M E. Burgoin AERO Design Ltd.	
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Document	Number		Docur	nent Title		Compliance Status
DCL792-1 79201	Revision 1 Revision 1		t Control List ployment Arm Installation			As per Compliance CP758-2 Rev 1
DCL792-2 79220 79230 79231 79231 79232 79233 79234 79235 79236 79237 ER758.01	Revision 1 Revision 0	Cargo De Cargo Arr Bearing S Cover Bushing Sleeve Lock Lean Bushing Bushings Engineeri	lleeve			
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DOCUMENT NO.	DOCUM	MENT CONTENT	REVISION
INSTALLATION DOCUMENTS			
79201	Cargo Deployment A	rm Installation	1
1CA758.90 FMS792.90	Instructions for Contil Flight Manual Supple		0
FABRICATION DOCUMENTS			
DCL792-2	Document Control Lis	1	
ENGINEERING DOCUMENTS			
APPROVAL: :: :: :: :: :: :: :: :: :: :: :: :: :	ORIGINAL DATE:	<i>AERO</i> DESI	GNITD
A APPROVED	07 May 2008 REVISION DATE: 27 May 2008	2013 – 39 th Ave NE, Calgar Ph. (403) 250 Fax. (403) 250	y, Alberta, T2E 6R7 -8027
CUSHOB-157/D	SHEET 1 OF 1	Bell 212, 412, 205A-1, 205B Cargo Deployment Arm Installation	
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DOCUMENT NO.	DOCUI	MENT CONTENT	REVISION
INSTALLATION DOCUMENTS			
FABRICATION DOCUMENTS			
79220	Cargo Deployment A	arm Assembly	1 1
79230 79231 79232 79233 79234 79235 79236 79237	Cargo Arm Bearing Sleeve Cover Bushing Sleeve Lock Leaver Bushing Bushings		0 0 0 0 0 0
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ENGINEERING DOCUMENTS ER758.01	Engineering Report		0
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W. ROOM	REVISION DATE: 27 May 2008	Ph. (403) 250-802 Fax. (403) 250-833	27
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		ISPORT RAFT OR AIRCRAFT ESS REQUIREMENTS		AE-100 No.: Initial Issue Date: Revision:		8-3 ay, 2008		
Aircraft Mfgr: Aircraft Model: Registration:	odel: 212, 412, 205A-1, 205B		LI, C-FAHR, HZ, C-FAHB, HL, C-FALV, RZ, C-FAHK, HV, C-FAHP, HO, C-FAHG, LK, C-GRNR, Airplane Helicopter Appliance Component Component		Revision Date: Approval No.: Delegation No.: Delegate Name: Classification of Designee: Employer:		2 16 June 2008 C-LSH08-157/D 290M E. Burgoin AERO Design Ltd.	
		LI	ST OF APPROVED RE	PORTS AND DATA				
Document	t Number		Doc	cument Title			Compliance Status	
DCL792-1 79201 DCL792-2	Revision 2 Revision 1	Cargo De	it Control List ployment Arm Installation				As per Compliance CP758-2 Rev 1	
79220 79230 79231 79232 79233 79234 79235 79236 79237 ER758.01	Revision 1 Revision 0	Cargo Ari Bearing S Cover Bushing Sleeve Lock Lea Bushing Bushings	Sleeve	у				
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INSTALLATION DOCUMENTS				
79201	Cargo Deployment	Cargo Deployment Arm Installation		
ICA758.90 FMS792.90		Instructions for Continued Airworthiness Flight Manual Supplement		
FABRICATION DOCUMENTS				
DCL792-2	Document Control L	ist Cargo Arm Assembly	1	
ENGINEERING DOCUMENTS				
APPROVAL: Teassport Canada E BURGON (MR. 1664)	ORIGINAL DATE: 07 May 2008 REVISION DATE: 16 June	AERO DESIG 2013 – 39 th Ave NE, Calgary, A Ph. (403) 250-802 Fax. (403) 250-83	berta, T2E 6R7	
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DEPARTMENT OF TRAN STATEMENT OF COMPLIANCE OF AIRC COMPONENTS WITH THE AIRWORTHIN Aircraft Mfgr: Bell 212, 412, 205A-1, 205B Registration: C-GALI, C-FAHR, C-FAHL, C-FAHB, C-FAHL, C-FALV, C-GIRZ, C-FAHK, C-GAHV, C-FAHP, C-GAHO, C-FAHG, C-FALK, C-GRNR, C-FAHC			RAFT OR AIRCRA	ENTS	AE-100 No.: Initial Issue Date: Revision: Revision Date: Approval No.: Delegation No.: Delegate Name: Classification of Designee: Employer:	14 Ma 0 C-LSI 290M E. Bu	H08-157/D
		LI	ST OF APPROVE	D REPO	RTS AND DATA		
Document	Number			Docum	ent Title		Compliance Status
DCL798-1 79801 DCL798-2	Revision 0 Revision 0	Rappel S	nt Control List tep Installation				As per Compliance CP798 Rev 0
79820 79830 79831 79832 79833 79834 79835 78230	Revision 0	Rappel S Step Mounting	tep Assembly Plate Stn 84 Plate Stn 129				
ER758.01	Revision 0	Engineeri	ing Report				
TP798.02	Revision 0	Test Plan	/Report (Flight)				
			DATA APPRO	VED BY	TRANSPORT CANADA		
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DOCUMENT NO.	DOCU	MENT CONTENT	REVISION
INSTALLATION DOCUMENTS			
79801	Rappel Step Installat	tion	0
ICA758.90	Instructions for Conti	nued Airworthiness	0
FABRICATION DOCUMENTS			
DCL798-2	Document Control Li	0	
ENGINEERING DOCUMENTS			
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APPROVAL	ORIGINAL DATE:	<i>AERO</i> DES	IGN LTD.
The second second	14 May 2008 REVISION DATE:	2013 – 39 th Ave NE, Calga Ph. (403) 25 Fax. (403) 25	ry, Alberta, T2E 6R7 0-8027
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INSTALLATION DOCUMENTS					
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ENGINEERING DOCUMENTS ER758.01 TP798.02 APPROVAL:	Engineering Report Test Plan/Report		0 0		
AFFROVAL.	ORIGINAL DATE: 14 May 2008 REVISION DATE:	AERO DESIGN LTD. 2013 – 39 th Ave NE, Calgary, Alberta, T2E 6R7 Ph. (403) 250-8027 Fax. (403) 250-8333			
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DEPARTMENT OF TRAN STATEMENT OF COMPLIANCE OF AIRC COMPONENTS WITH THE AIRWORTHIN			RAFT OR AIRCRAFT	AE-100 No.: Initial Issue Date: Revision:	AE758-4 14 May, 2008		
Aircraft Mfgr: Aircraft Model: Registration:	Bell 212, 412, 205 205B C-GALI, C-FA C-FAHL, C-FA C-GIRZ, C-FA C-GAHV, C-F C-GAHO, C-F C-FALK, C-G C-FALK, C-G	AHR, AHB, ALV, AHK, FAHP, FAHG,	Model Type Airplane Helicopter Appliance Component	Approval No.: C-LSH08-157/D			
		LI	ST OF APPROVED REPO	RTS AND DATA			
Document	Number		Docun	nent Title		Compliance Status	
DCL798-1 79801	Revision 1 Revision 0		t Control List tep Installation			As per Compliance CP798 Rev 0	
79820 79830 79831 79832 79833 79834 79835 78230	Revision 0	Step Mounting					
ER758.01	Revision 0	Engineeri	ng Report				
TP798.02	Revision 0	Test Plan	/Report (Flight)				
			DATA APPROVED BY	TRANSPORT CANADA			
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DOCUMENT NO.	DOCUI	MENT CONTENT	REVISION
INSTALLATION DOCUMENTS			
79801	Rappel Step Installat	tion	0
ICA758.90	Instructions for Conti	nued Airworthiness	1
FABRICATION DOCUMENTS			
DCL798-2	Document Control Li	st Rappel Step Assembly	0
ENGINEERING DOCUMENTS			
APPROVAL: Transport Canada LLCPC	ORIGINAL DATE: 14 May 2008 REVISION DATE 16 June 2008	AERO DESIG 2013 – 39 th Ave NE, Calgary, A Ph. (403) 250-802 Fax. (403) 250-83	berta, T2E 6R7
C-15 HOB 157/5	SHEET 1 OF 1	Bell 212, 412, 205A Rappel Ste Installation	р
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MAST	DOCUMENTATION CHECKLIST			REGIL	IRED	FOR DOT USE ONLY RECEIVED		
MAST				YES	ND	YES	T NO	DATI
	PLIANCE PROGRAM			x				
01101	ER DRAWING LIST			×				
FLIGH	HT MANUAL SUPPLEMENT			×				
MAIN	TENANCE MANUAL SUPPLEMENT				х			
INSTR	RUCTIONS FOR CONTINUING AIRWORTHINESS			X				
ENGH	NEERING REPORTS			Х				
DESIG	ON DRAWINGS				X			
MANU	JFACTURE DRAWINGS & INSTALLATION INSTRUCTION	45		x				
ELEC.	TRICAL LOAD ANALYSIS				Х			
DRAF	T STC, LSTC OR RDA				Х			
WEIG	HT AND MOMENT CHANGE			X				
FLIGH	HT TEST DATA				X			
OTHE	R (Specify)				Х			
APPLI	C-LSH08-157 /	D		C-	08-	03	63	
literemi	tion to the payment of Aircraft Certification approval fees as prescrit egital expenses as in Aviation Regulation Directive No. 5, or equival PD Design Ltd.	bed in Cen lant, as ap	nadian Aviation Regu pitcable. For further	istians (CAR) s delais governi	Bectlon 104, i ng cost fectiv	agree to rein sty, refer to A	nburse Transpo AMA 519/4.	rt Ganac
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FORM AE-100

		E OF AIRC	NSPORT RAFT OR AIRCRAFT IESS REQUIREMENTS	AE-100 No.: Initial Issue Date: Revision:	AE75 14 Ma	8-5 ay, 2008
Aircraft Mfgr: Aircraft Model: Registration:	Bell 212, 412, 205 205B C-GALI, C-FA C-FAHZ, C-F C-GIRZ, C-F/ C-GAHV, C-F C-GAHO, C-F C-FALK, C-G C-FAHC	AHR, AHB, ALV, AHK, FAHP, FAHG,	108-157/D goin Design Ltd.			
		LI	ST OF APPROVED REPO	PRTS AND DATA		
Document	Number		Docun	nent Title		Compliance Status
DCL801 80120	Revision 0 Revision 0	Documer Bracket	nt Control List			As per Compliance CP798 Rev 0
ER801.01	Revision 0	Engineer	ing Report			
			DATA APPROVED BY	TRANSPORT CANADA		
DATA LISTED A	ABOVE AND O	N THE ATT DURES AN	ACHED SHEETS NUMBE D FOUND TO COMPLY, T	ON OF TRANSPORT, I HEREBY C RED NII HAVE BEEN EXAM O THE BEST OF MY KNOWLE	IINED II	N ACCORDANCE
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			HESE DATA	E. Burgoin, DAR 290M	<u>`</u>	

DOCUMENT NO.	DOCUI	MENT CONTENT	REVISION
INSTALLATION DOCUMENTS			
FABRICATION DOCUMENTS 80120	Bracket		0
00120	- Broket		
ENGINEERING DOCUMENTS ER801.01	Engineering Report -	- Bracket	0
APPROVAL: Transport Canada E. B. JOOGHN LORGER AM	ORIGINAL DATE: 14 May 2008 REVISION DATE:	AERO DESIGN 2013 – 39 th Ave NE, Calgary, Al Ph. (403) 250-802 Fax. (403) 250-833	berta, T2E 6R7 7
MARRIANED 13 / C-ASHOB-157/5	SHEET 1 OF 1	Bell 212, 412, 205A BRACKET	-1, 205B
And San (4 May 2008)	DO	CL801	O

758

Regualtory Load Requirements (FAR 29 Amendment 2)

$$n_{man} := 3.5$$

Maneuvering load factor

$$n_{sf} := 1.5$$

Safety factor

$$n_{ff} := 1.15$$

Fitting factor

Allowable Ultimate Loads on Helicopter Attachment Fittings

Roof fitting allowable at FS 105.1, Ref: Bell Helicopter

Floor allowable at FS 131.0, Ref: Bell Helicopter

APPLIED LOADS

Assume rappler and gear weighs maximum of 350 lb.

$$p_{rappel FS} := 350 \cdot lbf$$

Max rappel weight, selected by applicant

Limit load condition

$$p_{rappel_lim} = 1225 \cdot lbf$$

$$p_{rappel FS} = 350 \cdot lbf$$

$$n_{man} = 3.5$$

$$p \text{ rappel_ult} \stackrel{:=}{=} p \text{ rappel_FS} \cdot n \text{ man} \cdot n \text{ sf}$$

Ultimate load condition

$$p_{rappel ult} = 1837.5 \cdot lbf$$

$$p_{rappel FS} = 350 \cdot lbf$$

$$n_{man} = 3.5$$

$$n_{sf} = 1.5$$

Ultimate vertical reaction on roof fitting at FS 105.1

Flight Station where rappel load is applied

$$R_{FS105.1} := \frac{p_{rappel_ult} \cdot (131.0 - rappel_FS)}{131.0 - 105.1}$$

$$R_{FS105.1} = 1298.3 \cdot lbf$$

Where:

$$p_{rappel_ult} = 1837.5 \cdot lbf$$

$$rappel_FS = 112.7$$

MS :=
$$\frac{P_{allow}_{FS105.1}}{R_{FS105.1}^{n} \text{ ff}} - 1$$

$$MS = 0.005$$

Where:

 $P_{allow FS105.1} = 1500 \cdot lbf$

Ultimate vertical reaction on floor fitting at FS 131.0

$$R_{FS131.0} := \frac{p_{rappel_ult} \cdot (rappel_FS - 105.1)}{131.0 - 105.1}$$

$$R_{FS131.0} = 539.2 \cdot lbf$$

Where:

$$p_{rappel_ult} = 1837.5 \cdot lbf$$

$$rappel_FS = 112.7$$

MS :=
$$\frac{P_{allow}_{FS131.0}}{R_{FS131.0} \cdot n_{ff}} - 1$$

$$MS = 2.467$$

Where: $P_{allow FS131.0} = 2150 \cdot lbf$

Assume rappler and gear weighs maximum of 300 lb.

$$p_{rappel FS} := 300 \cdot lbf$$

Max rappel weight, selected by applicant

$$p$$
 rappel $\lim_{n \to \infty} p$ rappel FS^{n} man

Limit load condition

$$p_{rappel FS} = 300 \cdot lbf$$

$$n_{man} = 3.5$$

Ultimate load condition

$$p_{rappel ult} = 1575 \cdot lbf$$

$$p_{rappel FS} = 300 \cdot lbf$$

$$n_{man} = 3.5$$

$$n_{sf} = 1.5$$

Ultimate vertical reaction on roof fitting at FS 105.1

Flight Station where rappel load is applied

$$R_{FS105.1} := \frac{p_{rappel_ult} \cdot (131.0 - rappel_FS)}{131.0 - 105.1}$$

$$R_{FS105.1} = 1301.4 \cdot lbf$$

$$p_{rappel_ult} = 1575 \cdot lbf$$

rappel
$$FS = 109.6$$

$$MS := \frac{P_{allow_FS105.1}}{R_{FS105.1} \cdot n_{ff}} - 1$$

$$MS = 0.002$$

Where: $P_{allow FS105.1} = 1500 \cdot lbf$

Ultimate vertical reaction on floor fitting at FS 131.0

$$R_{FS131.0} := \frac{p_{rappel_ult} \cdot (rappel_FS - 105.1)}{131.0 - 105.1}$$

$$R_{FS131.0} = 273.6 \cdot lbf$$

Where:

$$rappel_FS = 109.6$$

MS :=
$$\frac{P_{allow}_{FS131.0}}{R_{FS131.0} \cdot n_{ff}} - 1$$

$$MS = 5.832$$

Where:
$$P_{allow_FS131.0} = 2150 \cdot lbf$$

Critical bending load on Rappel Bar occurs when load applied to mid-point of span

$$M_{max} := \frac{1}{4} \cdot p_{rappel_ult} \cdot (131.0 \cdot in - 105.1 \cdot in)$$

$$M_{max} = 10198.1 \cdot lbf \cdot in$$

Occuring at mid-point

Where:

$$p_{rappel ult} = 1575 \cdot lbf$$

$$p_{rappel FS} = 300 \cdot lbf$$

Section Properties of Rappel Tube

Tube outside diameter

$$w := 0.156 \cdot in$$

Tube wall thickness

$$ID := OD - 2 \cdot w$$

Tube inside diameter

$$ID = 0.938 \cdot in$$

$$I := \frac{\pi}{4} \cdot \left[\left(\frac{OD}{2} \right)^4 - \left(\frac{ID}{2} \right)^4 \right]$$

Moment of Inertia of tube

$$I = 0.082 \cdot in^4$$

$$OD = 1.25 \cdot in$$

$$ID = 0.938 \cdot in$$

Allowable Modulus of Rupture for 4130 Rappel Tube

$$L := 131.0 \cdot in - 105.1 \cdot in$$

Length of rappel tube

$$L = 25.9 \cdot in$$

$$\frac{OD}{W} = 8.013$$

D/t ratio

Modulus of Rupture, Ref: Mil-Hdbk-5E, page 2-222

Bending Stress in Tube

$$f_{b_{max}} = \frac{M_{max} \cdot \frac{OD}{2}}{I}$$

$$f_{b_{max}} = 77879.2 \cdot psi$$

Where:
$$M_{max} = 10198.1 \cdot lbf \cdot in$$

$$w = 0.156 \cdot in$$

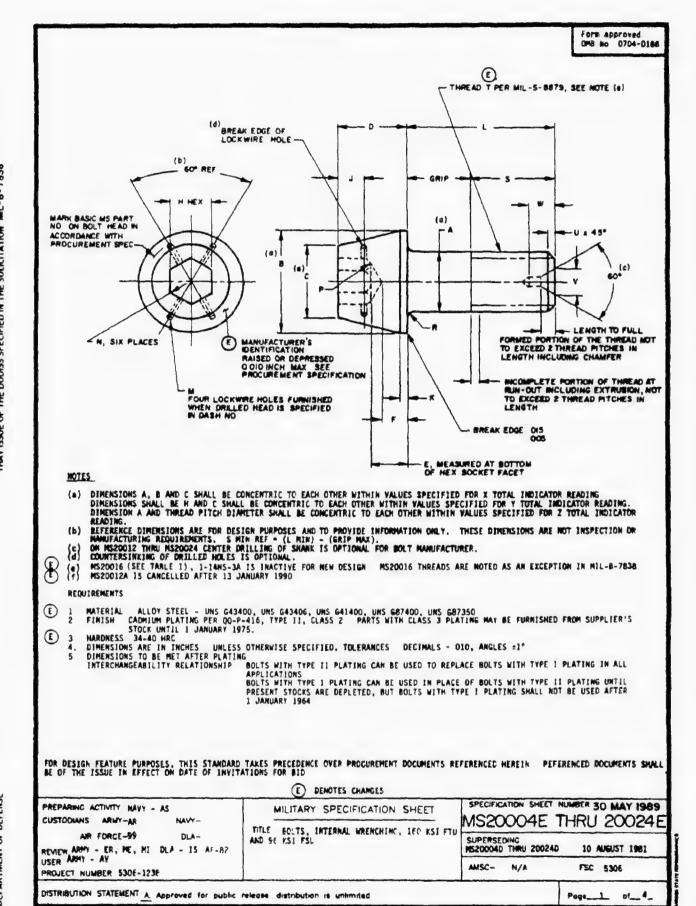
$$I = 0.082 \cdot in^4$$

$$p_{rappel_FS} = 300 \cdot lbf$$

$$MS := \frac{F_b}{f_{b_max} \cdot n_{ff}} - 1$$

$$MS = 0.507$$

6.



																Form appro CMS No 0	
BASIC MS PART NO	(a) TH	READ T	(a)	DIA		(a) B DIA		(a) C DIA	D D	MD TENS!	F MIN	и (n) HEX	J	K	+.005 - 000	N MAX RAD
R\$20004 R\$20005 R\$20006	1/4-28 5/15-24 3/8-24	UNJF-3/	.31 .37	92 17 42	M1M .2477 .3102 3727	438 .531 .649	#1N #28 521 639	.342 394 ,520	.250 312 375	.112 144 .183	068 094 116	2150	1880 .2190 .3130	078 094 .125	063	.037	.010
MS20007 MS20008 MS20009 MS20010 MS20012	9/16-18 5/8-18 3/4-16	UNJF-3/ UNJF-3/ UNJF-3/	49 3A .56 52 74	67 91 16 40 88	7468	1 230		534 ,625 ,723 826 921	500 562 625 750	208 ,247 .279 317 385	. 190 216 . 273	3785 4410 5035 5660	.3755 4380 .5005 5630	. 172 . 203 234 281	094	055	019
MS20014 MS20016 • MS20017 MS20018 MS20020	1 -12 1-1/8-12 1-1/4-12	NS -3A UNJF-3/ UNJF-	99 3A 1 12 3A 1 24	5	.9955 1.121 1.246	1 875 1	.615 865	1.249 1.275 1.598 1.768	.875 1.000 1 125 1.250 1.375	.527 .589 .667		7547	7507 7507 1.001 1.126	.344 .391 453 500	.125		.022
MS20022 MS20024 MS20017A	163/851/ 161/251/ 17/151/	UNJF-	3A 1 49			2 500 2	490 720	1 931 - 921 BLE I	1.500 -750 (CONT)	. 521	.586	1 256	1.251	,547 594 	. 156 . 684 (E) 58	E MOTE (f	
BASIC MS PART NO		10	RAC		(b) S MIN REF	±.016	(c) WAX	1 1	c) N AX	(b) (c CENTER DRILL SIZE		TEMSILE STRENGTH LB MIN		(a) ENTRICIT	2)
MS20004 MS20005 MS20006	MAX	MIN	.041	.031	.475 537 .662	.031				REF		6.190 9.820 15,200	.005 .006	.007 .008	0045		
M\$20006 M\$20007 M\$20008 M\$20009 M\$20010 M\$20012	020	010	.057	047	.787 .850 .912 1.037	062	18		200	2		20,600 27,400 34,600 43,600 63,200	.009 .010 .011 .012	.016	.006		
M\$20014 M\$20016 • M\$20017 M\$20018	030	015	073	063	1 152 1 287 1 475 1,600	078	25		260	3		86,100 112,000 114,000 144,000 180,000	.020 .022 .025	.022	.009		
MS20020 MS20022 MS20024 -MS20012A			089		1.725	094	.31		320 200	4	=	219,000 263,000 63,200	028	025	012		-
	NOTE (+)					SEE NOTE											
PREPARING A	CTIVITY N	AVY - A	S			MIL	_ITAR	Y SPE	CIFICA	TION SH	HEET	SPI	ECIFICATIO	N SHEET	NUME	ER 30 MA	Y 1989
REVIEW ARMY	FORCE-	99	NAVI DLA LA - II	L -	82		DLTS.	INTERNA		CHINC, 1		SUF PS2	ERSEDING	PU 20024		RU 20 10 AUGUS1	:
PROJECT NUI	48ER 530		normued	for	aublic re	nagen die	tob.it-	nn 18 11 ⁿ	lemited			***	SC- N	/A	D ₀	FSC 5306	
SISTREGION	31016#6	- ^	סייאים ייעיק	101	PUUIC PE		a ipyti	on II MU		-,						Y'	!

DD - 672 MY 1988

EMOUS EDITIONS OF THIS FORM ARE DEBOULTE

TABLE 11 DASH NOS GRIP LENGTHS AND BOLT LENGTH ASH GRIP MO = 010 1/4 5/16 3/8 7/16 1/2 9/16 5/8 3/4 7/8 1 1 1-1/6 1-1/4 4 .250 .750	3 125 3 250 3 375 3 500	3.3/5 3.500 3.625 3.75 3.75
ASH GRIP MS20004 MS20005 MS20006 MS20007 MS20008 MS20010 MS20012 MS20012 MS20014 MS20016 MS20017 MS20018 MS20017 MS20017 MS20018 MS20018 MS20017 MS20018 MS20017 MS20018 MS20018 MS20017 MS20018 MS20018 MS20017 MS20018 MS20018 MS20018 MS20018 MS20018 MS20018 MS20017 MS20018 MS20018 MS20017 MS20018 MS200	3 125 3 250 3 375 3 500 3 625 3 750 3 875 4 125 4 250 4 275	3.375 3.500 3 625 3.750
4 .250 .750	3 125 3 250 3 375 3 500 3 625 3 750 3 625 4 000 4 125 4 250 4 275	3.375 3.500 3.625 3.750
B 500 1.000 1.062 1.88 1.312 1.438 1.438 1.500 1.562 1.856 1.255 1.255 1.255 1.255 1.312 1.438 1.562 1.562 1.562 1.562 1.562 1.562 1.255 1.562 1.255 1.312 1.438 1.562 1.5	3 250 3 375 3 500 3 625 3 750 3 875 4 000 4 125 4 250 4 375	3.500 3.625 3.750
12	3 250 3 375 3 500 3 625 3 750 3 875 4 000 4 125 4 250 4 375	3.500 3.625 3.750
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32 2.000 2 500 2 562 2 688 2 812 2 812 2 812 2 875 2 938 3.062 3 188 3 312 3.312 3 500 3 675 34 2 125 2 625 2.688 2 812 2 938 3 000 3 062 3 188 3 312 3 438 3 438 3.625 3 750 386 2 255 2 750 2 812 2 938 3 062 3 188 3 122 3 438 3 562 3 750 38 2 375 2 812 2 938 3 062 3 188 3 122 3 438 3 562 3 750 3 875 3 88 2 375 2 875 2 938 3 062 3 188 3 182 3 122 3 438 3 562 3 688 3 812 3 812 4 000 4 125 4 2 625 3 125 3 188 3 312 3 438 3 562 3 688 3 812 3 812 4 000 4 125 4 2 625 3 125 3 188 3 312 3 438 3 562 3 688 3 812 3 812 4 000 4 125 4 2 625 3 125 3 188 3 312 3 438 3 562 3 688 3 812 3 812 4 000 4 125 4 2 625 3 125 3 188 3 312 3 438 3 562 3 688 3 812 3 812 4 000 4 125 4 2 625 3 125 3 188 3 312 3 438 3 562 3 688 3 812 3 812 4 000 4 125 4 2 625 3 125 3 188 3 312 3 438 3 562 3 688 3 812 3 938 4 125 4 250 4 375 4 62 8 75 3 375 3 438 3 562 3 688 3 812 3 938 4 125 4 250 4 375 4 62 8 75 3 3 250 3 562 3 688 3 812 3 812 4 000 4 125 4	3 750 3.875 4 000 4 125 4.250 4 375	
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38	4.250	4.125
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54 3.375 3.875 3.938 4.062 4.188 4.188 4.250 4.312 4.438 4.562 4.688 4.688 4.875 5.000 56 3.500 4.000 4.062 4.188 4.312 4.312 4.375 4.438 4.562 4.688 4.812 4.812 5.000 5.125 58 3.625 4.125 4.188 4.312 4.438 4.500 4.562 4.688 4.812 4.938 4.938 5.062 5.062 5.062 5.062 5.062 5.250 60 3.750 4.375 4.438 4.562 4.688 4.750 4.812 4.938 5.062 5.062 5.188 5.188 5.375 5.000	4 875	5.000
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	5.625	5.625 5.750
66 4.125 4.625 4.688 4.812 4.938 4.938 5.000 5.062 5.188 5.312 5.438 5.438 5.625 5.750	5 750 5 875	5.875 6.000
68 4 250 4 750 4 812 4 938 5 062 5 062 5 125 5 188 5 5312 5 438 5 562 5 562 5 575 5 875 70 4 375 4 875 4 938 5 5062 5 188 5 188 5 250 5 312 5 438 5 562 5 5688 5 5875 6 000	6 000 6 125	5.125 6.250
72 4 500 5 000 5 062 5 188 5 312 5 312 5 312 5 375 5 438 5.562 5 688 5.812 5 812 6.000 6 125 74 4.625 5.125 5.188 5.312 5 438 5.438 5.500 5.562 5.688 5.812 5.938 5 938 6 125 6 250	6 250 6,375	6.500
76 4 750 5 250 5 312 5 438 5 562 5 562 5 625 5 688 5 812 5 938 6 062 6 062 6 250 6 375 78 4 875 5 375 5 438 5 562 5 688 5 750 5 812 6 938 6 062 6 188 6 188 6 375 6 500	6 500 6 625	6.625
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88 5 500 6 000 6 062 6 188 6 312 6 312 6 375 6 438 6 562 6 688 6 812 6 812 7.000 7 125	7 250	7.375
90 5.625 6 125 6 188 6 312 6 438 6 438 6 500 6 562 6 688 6 812 6 938 6,938 7.125 7.250 7 375 92 5 750 6.250 6 312 6 438 6 562 6 562 6 625 6 688 8 812 6 938 7.062 7 062 7.250 7 375 94 5 875 6,375 6 438 6 562 6 688 6 6750 6 812 6 938 7 062 7.188 7 188 7 375 7.500	7.500 7.625	7.625
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06 6 750 7.625 7 688 7 812 7.938 8 062 8.062 8 250 8 375		8 500 8 525
12 7.000 7.875 7 938 8 062 8 188 8 312 8 312 8.500 8 625 1	8 750	8.875
16 7 250 8 750 8 875	9 000	
20 7 500 9 125	9 250	9 375
	9 375	
26 7 875 9 375 9 500 9 375 9 500 9 500 9 625	9.625	
10 6 875	8 625 8 750 8 875 9 000 9 125 9 250 9 375 9 500 9.625	8 7 8.8 9.0 9 1 9.2 9 3 9 5 9 5 9 7

UNASSIGNED DASH NUMBERS SHALL NOT BE USED, EXCEPT THOSE DASH NUMBERS COVERED BY THE FOLLOWING CODING NOTE

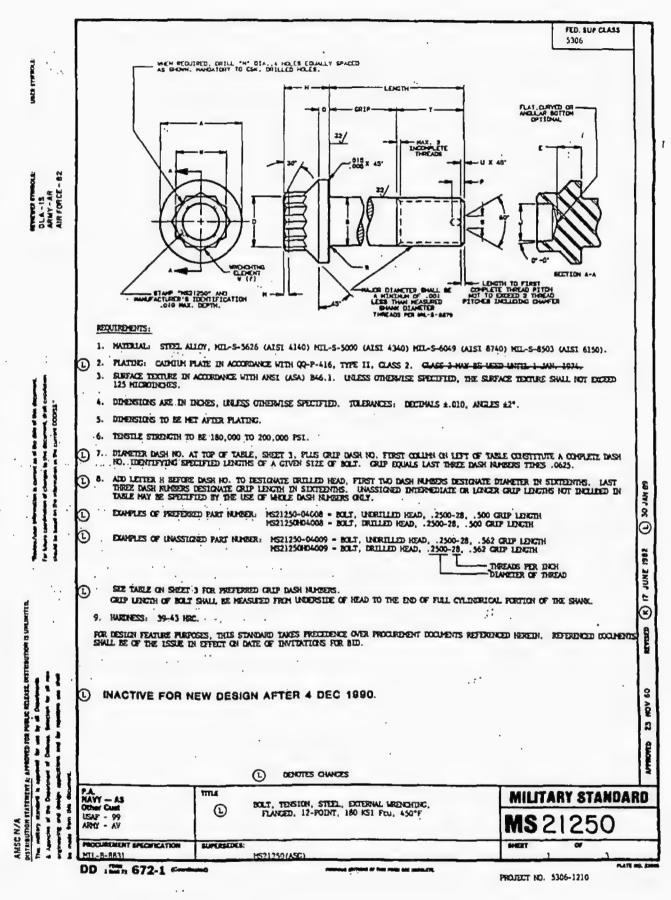
DASH NUMBERS INDICATE PREFERRED GRIF LENGTHS IN 125 INCREMENTS INTERMEDIATE GRIP LENGTHS BETWEEN THOSE LENGTHS LIETED, BAY BE
SPECIFIED IN .062 INCREMENTS BY INTERMEDIATE DASH NUMBERS. LENGTH AND GRIP OF A BOLT WITH AL ODD NUMBER FOR THE DASH NUMBER MILL BE
.062 GREATER THAN SHOWN FOR THE BOLTS WITH THE PRECEDING EVEN DASH NUMBER. ONLY BOLT DIAMETER FOR BHICH THERE ARE QUALIFIED.
PRODUCTS LISTED ON QPL-7838 SHALL BE USED FOR DESIGN.

FOR EASH BOLT DIAMETER GRIP LENGTHS GREATER OR LESS THAN THOSE BESIGNATED BY ASSIGNED DASH NUMBERS ON TABLE II ARE INACTIVE FOR DESIGN

ADO "H" BEFORE DASH NUMBER FOR BOLT WITH DRILLED HEAD

EXAMPLES OF PART NUMBERS MS20017-18 = 1-12 BOLT, 2.438 INCH LONG, 1.125 INCH GRIP, UNDRILLED MEAD MS20017H18 = 1-12 BOLT, 2.438 INCH LONG, 1.125 INCH GRIP, DRILLED MEAD.

have At		SPECIFICATION SHEE	T NUMBER 30 MAY 1989
PREPARING ACTIVITY NAVY - AS	MILITARY SPECIFICATION SHEET		
CUSTODIANS ARMY-AR NAVY-	TITLE AND ADDRESS	MS20004E	THRU 20024E
AR FORCE-99 DLA- REVIEW ARMY - ER, ME, MI DLA - 15 AF-82	TITLE BOLT - INTERNAL WRENCHING, 160 KS; FTE AND 96 KS; FSL	SUPERSEDING MS20004D THRU 2002	24D 10 AUGUST 1981
USER ARMY . AV PROJECT NUMBER 5306-121F		AMSC- N/A	FSC 5306
DISTRIBUTION STATEMENT A Approved for public is	release distribution is unlimited		Page_4_ of_4



															7 8 0	5306	LASS
CRIP	CRIP						DIA	METER	DASH N	UMBERS							
NO.	±.010	02	03	04	05	06	07	08	09	10	12	14	16	18	20	22	24
								LEN	СТН								
004	,250 4375	.655	.690	.762	.849	.895	.991	1.038	1 7/7	1,294	633						
008	.500	. 905	940	1.012	1.099	1.145	1.241	1.288	1.372	1,219	1556	764	1.999	2,170	7 288	1 110	4 78
010	.623 .750	1 1221	4 4001	1 7271	17.0	1 1951	1.491	T STAI	1.6271	1 6691	1.8061	2.0141	Z.Z49	2.420	DIC.S	2.033	12.780
014	.875	1.280	1,315	1.387	1,474	1.520	1.616	1,663	1.747	1,794	1,931	2,139	2.374	2.545	2.655	2,780	2,90
016	1,000	1.530	1 363	1.512	1.599	1.770	1.741	1.788	1,872	2.044	2.056	2.3891	2.624	2.795	2,905	1.030	3.15
020	1,250	1,655	1.690	1,762	1.849	1.895	1,991	2.038	2,122	2.169	2.306	2,514	2.749	2,920	3,030	3,155	3,28
022	1,375	1.780	1,015	1,887	1,974	2.020	2,116	2.163		2,294							
024	1.625	2.030	2.065	2.137	2.224	2.270	2.366	2.413	2.497	2.544	2.6811	2.889	3.124	3.295	3.405	3,530	3.65
028	1.750	2 155	2 190	2 262	2.349	2,395	2,491	2,538	2.622	2,669	2.806	3.014	3.249	3,420	3.530	3,655	3.78
030	2.000	2,280	2,315	2.387	2.474	2.520	2,616	2,663	2.747	2,794	2,931 1,056	3,139	3,3/4	3,343	3.780	3.780	4.03
034	2,125	2.530	2.565	2.637	2.724	2.770	2.866	2,913	2.997	3.044	3.181	3,389	3.624	3.795	3.905	4.030	4.15
035	2,16X 2,250					2 811										ł	1
036	2.375	2.780	2.815	2.887	2.974	3.020	3.116	3.163	3,247	3.194	3.431	3,639	3.874	4,045	4,155	4,280	4,40
039	7 437							1.225		1	1	- 1					1
040	2.300	2.905	3.065	3.012	3.099	3,145	3,241	3.288	3.372	3.544	3.556	3.889	4.124	4.295	4.40	4.530	4.6
044	2,750	3,155	3.190	3.262	3,349	3.395	3.491	3.538	3.622	3.669	3.806	6.014	4,249	4,420	4.330	4,65	4.7
046	2.875	3.280	3.315	3.387	3.474	3.520	3.616	3.663	3.747	3.794	3.931	4.1391	4.374	4.545	4.653	4.780	0 4 , 90
050			3.565	1 637	3 776	3.770	1.866	3.913	3.997	4.044	4.161	4.389	4.624	4.795	4.90	5.030	13.15
052		3.655		1.762	3.849	3.895	3.991	4.038	4.122	4.169	4.306	4.514	4.749	4.920	5.030	5.15	5 5.20
054	3.375	3.780	3.815	3.887	3.974	4.020	4,116	4.163	4.247	4.294	4.431	4.639	4.000	3.043	3.13	5.280	
058	3.625			6.137	4.224	4.270	4,366	4.413	4.497	4,544	4,681	4.889	5.124	3,295	5,405	_	
060		4.155		4.262	4.349	4.395	4.491	4.538	4.622	4.669	4.806	5.014	5.249	5.420	5.530	5,655	
062	3.875			4.387	4.474	4.520	4,616	4.663	4.747	4,794	4.931	5.139	5,374	3 670			
064	4,125	6.530	4.440	4.512	4.399	4.770	4.866	6.913	4.997	5.044	5.181	5.389	3.624	15.795		6,030	
068	4.250	4.655	4.690	4.762	4.849	4.895	4,991	5.038	5.122	5.169	5,306	5.514	5.749	5.920	6.030	6.15	6.2
070	4.375	4.780	4.815	4.887	4.974	5.020	5,116	5,163	5.247	5.294	5,431	5,639	5.874	6.170	6.280	6.40	16.4
074		5.030								5.544						6,530	
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082	3.125	3.330	_		3.724	5.770	15.866	5.913	3,997	6.044	6,181	6,389	6,624	16,79	6,90	7,030	217.1
084	5,250			5.762	3,849	5,895	5,991	6,038	6.122	6,169	6.306	6.514	6,745	6,920	7.03	7.15	5 7.2 5 7.4
086		5.780						6,288	6.372	6,294	6.556	6.764	6.999	7.170	7.28	7,40	37.3
090	5,625	6,030	6,065	6,137	6,224	6,270	6.366	6.413	6.497	6,544	6,681	6.889	7.124	7.29	7,40	317.33	017.6
092	5.750	6.155	6.190	6.262	6.349	6.395	6.491	6,538	6.622	6.669	6,806	7,014	7,249	77.42	7,53	7.63	2/7-2
094	6.000	6.405	6.440	6.512	6.199	6.645	6.741	6.788	16.872	16.919	7.056	7.264	7.49	17.67	317.75	017,90	518.0
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APPENDIX A-3 NORMAL CATEGORY ROTORCRAFT - CAR 529

ICA 758.90 REV 1

BLOCK 1

Name of the applicant for the design change approval:

Aero Design Ltd.

Description of the design change:

Installation of Rappel Mount Provision, Cargo Arm and Rappel Step on Bell 205A-1/205B/212/412

Certification Basis of design change and revision date:

FAR 29, Amendment 29-2

CAR Standard A529.1(c) Program showing how changes to supplemental ICA made by the applicant or by the manufacturers of products and appliances installed in the aeroplane pursuant to the design change will be distributed:

Section 0-3 of Supplemental ICA (ICA 758.90)

Installation Drawing 75801/79201/79801

BLOCK 2

Note: Enter "N/A" when no supplemental ICA are needed.

CAR Standard 513.05 (1) (g) (iv): Installation Instructions:

Regulatory Standard Reference Column 1	Design Approval Holder (DAH) ICA Reference Column 2	Applicant Means of Compliance Supplemental ICA Requirements Column 3
A529.2 (a) Manual(s) (a) The Instructions for Continued Airworthiness must be in the form of a manual or manuals as appropriate for the quantity of data to be provided.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manuals, BHT-205A1-MM-1 BHT-205B-MM BHT-212-MM BHT-412-MM	Supplemental ICA ref: Single Manual (ICA758.90)
A529.2 (b) Practical arrangement (b) The format of the manual or manuals must provide for a practical arrangement.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual	Supplemental ICA ref: Arranged in ATA format
A529.3 The Instructions for Continued Airworthiness must contain the following manuals or sections, as appropriate, and information:		
A529.3 (a) Rotorcraft maintenance manual or section		
A529.3 (a) (1) (Introduction) (1) Introduction information that includes an explanation of the rotorcraft's features and data to the extent necessary for maintenance or preventive maintenance.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual, Chapter 1	Supplemental ICA ref: Section 0-1

MSI 53 - Review of Supplemental Instructions for Continued Airworthiness

Regulatory Standard Reference Column 1	Design Approval Holder (DAH) ICA Reference Column 2	Applicant Means of Compliance Supplemental ICA Requirements Column 3
A529.3 (a) (2) (Description) (2) A description of the rotorcraft and its systems and installations including its engines, rotors, and appliances.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual, Chapter 1	Supplemental ICA ref: Section 0-5
A529.3 (a) (3) Control & Operation (3) Basic control and operation information describing how the rotorcraft components and systems are controlled and how they operate, including any special procedures and limitations that apply.	ICA ref: N/A	Supplemental ICA ref: N/A
A529.3 (a) (4) Servicing (4) Servicing information that covers details regarding servicing points, capacities of tanks, reservoirs, types of fluids to be used, pressures applicable to the various systems, location of access panels for inspection and servicing, locations of lubrication points, lubricants to be used, equipment required for servicing, tow instructions and limitations, mooring, jacking, and levelling information.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual, Chapter 12	Supplemental ICA ref: N/A
A529.3 The Instructions for Continued Airworthiness must contain the following manuals or sections, as appropriate, and information:		
A529.3 (b) Maintenance Instructions. A529.3 (b) (1) Scheduling		
1) Scheduling information for each part of the rotorcraft and its engines, auxiliary power units, rotors, accessories, instruments, and equipment that provides the recommended periods at which they should be cleaned, inspected, adjusted, tested, and lubricated, and the degree of inspection, the applicable wear tolerances, and work recommended at these periods. However, the applicant may refer to an accessory, instrument, or equipment manufacturer as the source of this information if the applicant shows that the item has an exceptionally high degree of complexity requiring specialized maintenance techniques, test equipment, or expertise. The recommended overhaul periods and necessary cross-references to the Airworthiness Limitations section of the manual must also be included. In addition, the applicant must include an inspection program that includes the frequency and extent of the inspections necessary to provide for the continued airworthiness of the rotorcraft.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual, Chapter 5	Supplemental ICA ref: Section 5-1

Regulatory Standard Reference Column 1	Design Approval Holder (DAH) ICA Reference Column 2	Applicant Means of Compliance Supplemental ICA Requirements Column 3
A529.3 (b) (2) Troubleshooting (2) Troubleshooting information describing probable malfunctions, how to recognize those malfunctions, and the remedial action for those malfunctions.	ICA ref: N/A	Supplemental ICA ref: N/A
A529.3 (b) (3) Removal/replacement (3) Information describing the order and method of removing and replacing products and parts with any necessary precautions to be taken.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual, Chapter 25	Supplemental ICA ref: Section 25
A529.3 (b) (4) General (4) Other general procedural instructions including procedures for system testing during ground running, symmetry checks, weighing and determining the center of gravity, lifting and shoring, and storage limitations.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual, Chapter 7 and 8	Supplemental ICA ref: N/A
A529.3 (c) Access (c) Diagrams of structural access plates and information needed to gain access for inspections when access plates are not provided.	ICA ref: N/A	Supplemental ICA ref: N/A
A529.3 (d) Special inspections (d) Details for the application of special inspection techniques including radiographic and ultrasonic testing where such processes are specified.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual, Chapter 5	Supplemental ICA ref: N/A
A529.3 (e) Protective treatment (e) Information needed to apply protective treatments to the structure after inspection.	ICA ref: Bell Standard Practices Manual BHT-ALL-SPM, Chapter 3	Supplemental ICA ref: Section 5-3
A529.3 (f) Fasteners, torque values, etc (f) All data relative to structural fasteners such as identification, discard recommendations, and torque values.	ICA ref: Bell Standard Practices Manual BHT-ALL-SPM, Chapter 2	Supplemental ICA ref: Section 25-70
A529.3 (g) Special tools (g) A list of special tools needed.	ICA ref: N/A	Supplemental ICA ref: N/A

BLOCK 3

Note: The statement in block 5 does not constitute an approval of the Airworthiness Limitations Section. Airworthiness Limitations differ from other maintenance tasks, in that they are mandatory, as a direct condition of the approval of the type design. They are therefore referenced directly in the approval document itself. However, they must also be included in the Supplemental Instructions for Continued Airworthiness.

A529.4 AWL - Separate Section 1

The Instructions for Continued Airworthiness must contain a section titled Airworthiness Limitations that is segregated and clearly distinguishable from the rest of the document. This section must set forth each mandatory replacement time, structural inspection interval, and related structural inspection procedure approved under 529,571. If the Instructions for Continued Airworthiness consist of multiple documents, the section required by this paragraph must be included in the principal manual. This section must contain a legible statement in a prominent location that reads: "The Airworthiness Limitations section is approved by the Minister and specifies maintenance required by any applicable airworthiness or operating rule unless an alternative program has been approved by the Minister."

ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual, Chapter 4

Supplemental ICA ref: Chapter 4

___ Date: ZLMX, Evo 3

BLOCK 4	- Applicant	Statement of	Compliance
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The Supplemental ICA referenced above comprises the complete listing of supplemental ICA necessary to show compliance with the regulatory standard that supports this change in type design.

Applicants Signature:

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BLOCK 5 - Minister's Statement of Acceptability

Applicants Name: E. Burgoin, P.Eng. DAR 290M

APPENDIX A-3 NORMAL CATEGORY ROTORCRAFT - CAR 529

BLOCK 1

Name of the applicant for the design change approval:

Aero Design Ltd.

Description of the design change:

Installation of Rappel Mount Provision, Cargo Arm and Rappel Step on Bell 205A-1/205B/212/412

Certification Basis of design change and revision date:

FAR 29, Amendment 29-2

CAR Standard A529.1(c) Program showing how changes to supplemental ICA made by the applicant or by the manufacturers of products and appliances installed in the aeroplane pursuant to the design change will be distributed:

Section 0-3 of Supplemental ICA (ICA 758.90)

CAR Standard 513.05 (1) (g) (iv): Installation Instructions:

Installation Drawing 75801/79201/79801

BLOCK 2

Note: Enter "N/A" when no supplemental ICA are needed.

Regulatory Standard Reference Column 1	Design Approval Holder (DAH) ICA Reference Column 2	Applicant Means of Compliance Supplemental ICA Requirements Column 3
A529.2 (a) Manual(s) (a) The Instructions for Continued Airworthiness must be in the form of a manual or manuals as appropriate for the quantity of data to be provided.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manuals, BHT-205A1-MM-1 BHT-205B-MM BHT-212-MM BHT-412-MM	Supplemental ICA ref: Single Manual (ICA758.90)
A529.2 (b) Practical arrangement (b) The format of the manual or manuals must provide for a practical arrangement.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual	Supplemental ICA ref: Arranged in ATA format
A529.3 The Instructions for Continued Airworthiness must contain the following manuals or sections, as appropriate, and information:		
A529.3 (a) Rotorcraft maintenance manual or section		
A529.3 (a) (1) (Introduction) (1) Introduction information that includes an explanation of the rotorcraft's features and data to the extent necessary for maintenance or preventive maintenance.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual, Chapter 1	Supplemental ICA ref: Section 0-1

MSI 53 – Review of Supplemental Instructions for Continued Airworthiness

Regulatory Standard Reference Column 1	Design Approval Holder (DAH) ICA Reference Column 2	Applicant Means of Compliance Supplemental ICA Requirements Column 3
A529.3 (a) (2) (Description) (2) A description of the rotorcraft and its systems and installations including its engines, rotors, and appliances.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual, Chapter 1	Supplemental ICA ref: Section 0-5
A529.3 (a) (3) Control & Operation (3) Basic control and operation information describing how the rotorcraft components and systems are controlled and how they operate, including any special procedures and limitations that apply.	ICA ref: N/A	Supplemental ICA ref: N/A
A529.3 (a) (4) Servicing (4) Servicing information that covers details regarding servicing points, capacities of tanks, reservoirs, types of fluids to be used, pressures applicable to the various systems, location of access panels for inspection and servicing, locations of lubrication points, lubricants to be used, equipment required for servicing, tow instructions and limitations, mooring, jacking, and levelling information.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual, Chapter 12	Supplemental ICA ref: N/A
A529.3 The Instructions for Continued Airworthiness must contain the following manuals or sections, as appropriate, and information:		
A529.3 (b) (1) Scheduling 1) Scheduling information for each part of the rotorcraft and its engines, auxiliary power units, rotors, accessories, instruments, and equipment that provides the recommended periods at which they should be cleaned, inspected, adjusted, tested, and lubricated, and the degree of inspection, the applicable wear tolerances, and work recommended at these periods. However, the applicant may refer to an accessory, instrument, or equipment manufacturer as the source of this information if the applicant shows that the item has an exceptionally high degree of complexity requiring specialized maintenance techniques, test equipment, or expertise. The recommended overhaul periods and necessary cross-references to the Airworthiness Limitations section of the manual must also be included. In addition, the applicant must include an inspection program that includes the frequency and extent of the inspections necessary to provide for the continued airworthiness of the rotorcraft.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual, Chapter 5	Supplemental ICA ref: Section 5-1

MSI 53 - Review of Supplemental Instructions for Continued Airworthiness

Regulatory Standard Reference Column 1	Design Approval Holder (DAH) ICA Reference Column 2	Applicant Means of Compliance Supplemental ICA Requirements Column 3
A529.3 (b) (2) Troubleshooting (2) Troubleshooting information describing probable malfunctions, how to recognize those malfunctions, and the remedial action for those malfunctions.	ICA ref: N/A	Supplemental ICA ref: N/A
A529.3 (b) (3) Removal/replacement (3) Information describing the order and method of removing and replacing products and parts with any necessary precautions to be taken.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual, Chapter 25	Supplemental ICA ref: Section 25
A529.3 (b) (4) General (4) Other general procedural instructions including procedures for system testing during ground running, symmetry checks, weighing and determining the center of gravity, lifting and shoring, and storage limitations.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual, Chapter 7 and 8	Supplemental ICA ref: N/A
A529.3 (c) Access (c) Diagrams of structural access plates and information needed to gain access for inspections when access plates are not provided.	ICA ref: N/A	Supplemental ICA ref: N/A
A529.3 (d) Special inspections (d) Details for the application of special inspection techniques including radiographic and ultrasonic testing where such processes are specified.	ICA ref: Bell 205A-1/205B/212/412 Maintenance Manual, Chapter 5	Supplemental ICA ref: N/A
A529.3 (e) Protective treatment (e) Information needed to apply protective treatments to the structure after inspection.	ICA ref: Bell Standard Practices Manual BHT-ALL-SPM, Chapter 3	Supplemental ICA ref: Section 5-3
A529.3 (f) Fasteners, torque values, etc (f) All data relative to structural fasteners such as identification, discard recommendations, and torque values.	ICA ref: Bell Standard Practices Manual BHT-ALL-SPM, Chapter 2	Supplemental ICA ref: Section 25-70
A529.3 (g) Special tools (g) A list of special tools needed.	ICA ref: N/A	Supplemental ICA ref: N/A

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Note: The statement in block 5 does not constitute an approval of the Airworthiness Limitations Section. Airworthiness Limitations differ from other maintenance tasks, in that they are mandatory, as a direct condition of the approval of the type design. They are therefore referenced directly in the approval document itself. However, they must also be included in the Supplemental Instructions for Continued Airworthiness.

A529.4 AWL - Separate Section 1 The Instructions for Continued Airworthiness must		
contain a section titled Airworthiness Limitations that is		
segregated and clearly distinguishable from the rest of		
the document. This section must set forth each		
mandatory replacement time, structural inspection interval, and related structural inspection procedure		
approved under 529.571. If the Instructions for	ICA ref: Bell 205A-1/205B/212/412	
Continued Airworthiness consist of multiple		Supplemental ICA ref: Chapter 4
documents, the section required by this paragraph	Maintenance Manual, Chapter 4	
must be included in the principal manual. This section		
must contain a legible statement in a prominent location that reads: "The Airworthiness Limitations		
section is approved by the Minister and specifies		
maintenance required by any applicable airworthiness		
or operating rule unless an alternative program has		\cup_{Λ}
been approved by the Minister."		
BLOCK 4 – Applicant Statement of Compliance		
The Supplemental ICA referenced above comprises that supports this change in type design.	the complete listing of supplemental ICA neces	sary to show compliance with the regulatory standard
that supports this change in type design.		
Applicants Signature:		Date:
Applicants Signature.		Date.
Applicants Name: E. Burgoin, P.Eng, DAR 290M		
Applicants Name E. burgon, F. Eng, DAN 250W		
BLOCK 5 – Minister's Statement of Acceptability		
The design change is adequately supported by exis	ting ICA and/or supplemental ICA, as identified a	above and is acceptable to the Minister.
Reviewer's Name: Phone #	Email: N	ail Routing Symbol:
Signature: Date:		NAPA Number

INSTRUCTIONS FOR CONTINUED AIRWORTHINESS ICA 758.90

Rappel Mount Provision

Cargo Deployment Arm

Rappel Step

Preface

These Instructions for Continued Airworthiness shall be included in the rotorcraft Maintenance Manual when;

- The Rappel Mount Provision assembled in accordance with AERO Design Ltd. Document Control List DCL758-1, Revision 2,
- The Cargo Deployment Arm assembled in accordance with AERO Design Ltd. Document Control List DCL792-1, Revision 2,
- The Rappel Step assembled in accordance with AERO Design Ltd. Document Control List DCL798-1, Revision 1, or later approved revision, is installed.

The information contained herein supplements the information in the basic Maintenance Manual. For Maintenance practices and procedures not contained in these Instructions for Continued Airworthiness refer to the basic Maintenance Manual and its approved supplements.

Revision 1
Original Date: 07 May, 2008

Revision Date: 16 June, 2008

<u>AERO Design Ltd.</u> Engineering Consultants 2013 – 39th Avenue N.E., Calgary, Alberta T2E 6R7 Phone: (403) 250-8027

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RECORD OF REVISIONS

Revision Number	Issue Date	Date Inserted	Ву	
0			Original Issue	
1	16 June 2008	16 June 2008	R. Rathwell	

LIST OF EFFECTIVE PAGES

List of Revisions	Revision 1 (Original Issue)	16 June, 2008
FISCOLI/CAISIOLIS	(Original Issue)	10 Julie, 2000

List of Effective Pages

Description	<u>Pages</u>	Revision No.
Cover	1	1
Revision Record/List of Effective Pages	2	1
Table of Contents	3	1
00-00-00	4-6	1
04-00-00	7	1
05-00-00	8-15	1
11-00-00	16-17	1
25-00-00	18-23	1
APPENDIX A	24-30	1

AERO	Design	Ltd.
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ICA 758.90

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CHAPTER 0 - INTRODUCTION

0-1 SCOPE

The following Instructions for Continued Airworthiness (ICA) satisfy the requirements of 14 CFR 29.1529, and provide the information necessary to complete the on-going maintenance and inspections required for rotorcraft embodying the Rappel Mount Provision, Cargo Deployment Arm and Rappel Step as described herein.

0-2 DEFINITIONS AND ABBREVIATIONS

ICA - Instructions for Continued Airworthiness

LH - Left Hand

RH - Right Hand

ID- Inside Diameter

BELL-IPB Bell Helicopters Illustrated Parts Book – Specific to each model

0-3 DISTRIBUTION

Copies of this ICA and amendments shall be distributed to all known purchasers of the Rappel Mount Provision, Cargo Deployment Arm and Rappel Step. Requests for a copy may be made in writing to:

AERO Design Ltd. 2013 39th Avenue N.E. Calgary, Alberta T2E 6R7

Fax: 403-250-8333

Email: info@aerodesign.ca

Any changes will be sent to Transport Canada. All changes will be recorded in the Record of Revisions page at the front of this document.

0-4 COMPATIBILITY

Prior to incorporating this modification, the installer shall establish that the interrelationship between this change and any other modification(s) incorporated will not adversely affect the airworthiness of the helicopter.

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0-5 GENERAL DESCRIPTION

Rappel Mount Provision

The Rappel Mount Provision Installation is a steel tube structure that mounts on the existing hardpoints of the helicopter roof structure.

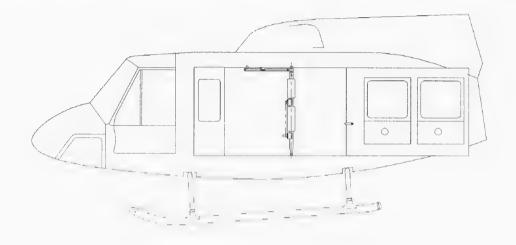


Figure 0-5.1 – Rappel Mount Provision Installation

Cargo Deployment Arm

The Cargo Deployment Arm Installation is an aluminum beam that mounts on the existing rear seat post stanchion of helicopter.

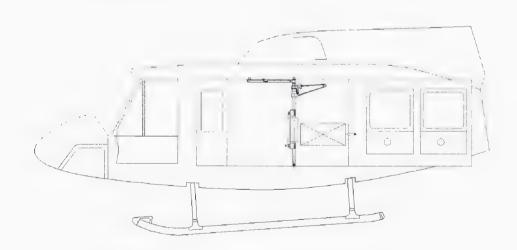


Figure 0-5.2 – Cargo Deployment Arm Installation

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Rappel Step

The Rappel Step Installation is an aluminum beam that attaches to the existing external hardpoints on the helicopter.

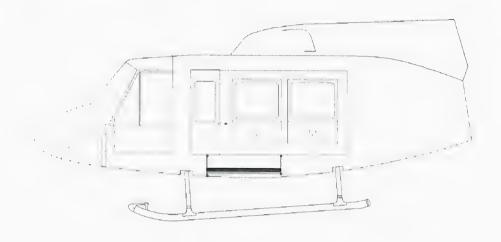


Figure 0-5.3 – Rappel Step Installation

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CHAPTER 4 - AIRWORTHINESS LIMITATIONS

The Airworthiness Limitations section is Transport Canada-approved and specifies maintenance required under Section 571 of the Canadian Aviation Regulations, unless an alternative program has been approved.

No additional airworthiness limitations have been imposed due the installation of the Rappel Mount Provision.

No additional airworthiness limitations have been imposed due the installation of the Cargo Deployment Arm.

No additional airworthiness limitations have been imposed due the installation of the Rappel Step.

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CHAPTER 5 – INSPECTION REQUIREMENTS

5-1 INSPECTION SCHEDULE

Continued airworthiness is contingent upon compliance with the following inspection items. These items shall be completed in conjunction with the rotorcraft Maintenance Inspection schedule, or other approved program, or upon removal and replacement of any component of the Rappel Mount Provision, Cargo Deployment Arm or Rappel Step. Scheduled Inspections consist of:

- 1. Daily Inspections Accomplished daily before flight operations, and
- 2. 300 Hour/180 Day Inspections Accomplished each 300 hours of flight operation or after 180 calendar days, whichever comes first.

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5-2 DAMAGE LIMITS / REPAIR INSTRUCTIONS

If damage is found in the inspections above, repair in accordance with the instructions below.



DO NOT REPAIR DAMAGE TO THE RAPPEL MOUNT PROVISION, CARGO DEPLOYMENT ARM OR RAPPEL STEP IF BEYOND THE LIMITS BELOW.

DATA	INSPECTION TASK DESCRIPTION		ΓIAL
REFERENCE	AND COMPONENT REPAIR/REPLACE ORDERS	MECH	OTHER
	RAPPEL MOUNT PROVISION		
	DAILY INSPECTION		
DRAWING 75801	a. Inspect the attachment of the Rappel Mount Provision to the helicopter roof tiedown studs for condition and security. Ensure the stud fittings are fully engaged onto the helicopters roof tiedown studs and are locked.		
	b. Inspect the gate mechanism for functionality. The gate should open smoothly and close automatically with the spring force only.		
	300 HOUR/180 DAY INSPECTION		
DRAWING 75801 75820	1. Rappel Mount Provision Installation;		
	a. Visually inspect the security of the Rappel Mount Provision to the Stanchion Post. If assembly movement at the stanchion post is detected, inspect the stanchion post, bolt (p/n AN4-24A) and Stanchion Adapter (p/n 75833-01) for wear. Replace worn part.		
	b. Visually inspect Stud Fittings. If cracked, corroded, worn or broken, replace part (p/n 33115 KINEDYNE).		
BELL-IPB	c. Visually inspect Adapter (MS22034-2) at the bottom of the Stanchion Post. If cracked, corroded, worn or broken, replace part.		
BELL-IPB	d. Visually inspect the helicopter roof and floor tiedown studs associated with this installation. If cracked, corroded, worn or broken, replace part per Bell-IPB.		

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DATA REFERENCE	INSPECTION TASK DESCRIPTION AND COMPONENT REPAIR/REPLACE ORDERS	INIT	TIAL OTHER
DRAWING 75820	Rappel Mount Provision Assembly; a. Visually inspect the fasteners, including the fastening of the stud fittings to the helicopter roof tiedown studs and the adapter at the		
	bottom of the stanchion post to the helicopter floor tiedown stud for security and condition. Replace as necessary. b. Visually inspect the opening and closing operation of the gate mechanism;		
	i. Gate mechanism must close automatically under the springs force only. Burrs and other sources of resistance may be dressed-out. Replace gate spring (p/n 24704 DYNALINE) if necessary.		
	ii. Gate mechanism must open freely. Burrs and other sources of resistance may be dressed-out. c. Visually inspect the Retainer for cracks, corrosion or other damage. - Nicks and/or gouges up to 0.030" deep and 0.125" wide may be dressed out to a smooth contour.		
	d. Visually inspect the all other aluminum components – Guide, Stanchion Adapter, and Curved Washer for cracks, corrosion or other damage Nicks and/or gouges up to 0.063" deep and 0.125" wide may be dressed out to a smooth contour.		
	e. Visually inspect the Rappel Tube for cracks, corrosion or other damage - Nicks and/or gouges up to 0.030" deep and 0.125" wide may be dressed out to a smooth contour.		
	f. Check all bolts for security and torque. Refer to Section 25-70.		

AND COMPONENT REPAIR/REPLACE ORDERS ARGO DEPLOYMENT ARM Inspect the attachment of the seat post stanchion to the helicopter down studs for condition and security. Ensure the floor adapter is y engaged onto the helicopter floor tiedown stud and is locked. Sure the stud fittings are fully engaged onto the helicopters roof down studs and are locked. Inspect the locking leaver for functionality. The leaver should open pothly and close automatically with the spring only.	MECH	OTHER
Inspect the attachment of the seat post stanchion to the helicopter down studs for condition and security. Ensure the floor adapter is y engaged onto the helicopter floor tiedown stud and is locked. Sure the stud fittings are fully engaged onto the helicopters roof down studs and are locked. Inspect the locking leaver for functionality. The leaver should open bothly and close automatically with the spring only.		
Inspect the attachment of the seat post stanchion to the helicopter down studs for condition and security. Ensure the floor adapter is y engaged onto the helicopter floor tiedown stud and is locked, sure the stud fittings are fully engaged onto the helicopters roof down studs and are locked. Inspect the locking leaver for functionality. The leaver should open pothly and close automatically with the spring only.		
down studs for condition and security. Ensure the floor adapter is y engaged onto the helicopter floor tiedown stud and is locked. Sure the stud fittings are fully engaged onto the helicopters roof down studs and are locked. Inspect the locking leaver for functionality. The leaver should open bothly and close automatically with the spring only.		
oothly and close automatically with the spring only.		
paneet the piveting of the Cargo Dayleyment Arm. The Cargo Arms		
nspect the pivoting of the Cargo Deployment Arm. The Cargo Arm ould pivot smoothly about the seat post stanchion.		
HOUR/180 DAY INSPECTION		
Cargo Deployment Arm Installation:		
Visually inspect the security of the Cargo Deployment Arm to the nchion Post. When locked, the cargo arm sideward motion limit at furthest point from the stanchion is +/- 0.25". If this motion is ected, inspect the stanchion post, bolt (p/n AN4-26A), Locking ever (p/n 79235-01) and Bearing Sleeve (p/n 79231-01) for wear. place worn part.		
Visually inspect the Stud Fittings. If cracked, corroded, worn or ken, replace part (p/n 33115 KINEDYNE).		
Visually inspect Adapter (MS22034-2) at the bottom of the nchion Post. If cracked, corroded, worn or broken, replace part.		
Visually inspect the helicopter roof and floor tiedown studs ociated with this installation. If cracked, corroded, worn or broken, lace part per Bell-IPB.		
Stanchion Post;		
Constitution of the Control of the C		
	Visually inspect Adapter (MS22034-2) at the bottom of the nchion Post. If cracked, corroded, worn or broken, replace part. Visually inspect the helicopter roof and floor tiedown studs ociated with this installation. If cracked, corroded, worn or broken, ace part per Bell-IPB.	Visually inspect Adapter (MS22034-2) at the bottom of the nchion Post. If cracked, corroded, worn or broken, replace part. Visually inspect the helicopter roof and floor tiedown studs ociated with this installation. If cracked, corroded, worn or broken, ace part per Bell-IPB. Stanchion Post; Visually inspect the Seat Post Stanchion for cracks, corrosion or

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DATA REFERENCE	INSPECTION TASK DESCRIPTION	INI	ΓIAL
	AND COMPONENT REPAIR/REPLACE ORDERS	MECH	OTHER
DRAWING 79220	3. Cargo Deployment Arm Assembly;		
	a. Bushing – 79233-01;		
	a) Bushing must not rotate or move within the aluminum cargo arm. b) 3/16 roll-pin must be in place. c) Visually inspect the bushing for cracks, corrosion or other damage - Nicks and/or gouges up to 0.030" deep and 0.125" wide may be dressed out to a smooth contour.		
	b. Locking Mechanism;		
	a) Visually inspect the locking operation for the deployed and stowed position;		
	i. Locking Leaver must engage automatically under the locking springs force. Burrs and other sources of resistance may be dressed-out. Replace Locking Spring (p/n 24704 DYNALINE), Ball Bearing (Dia. 0.500in) if necessary.		
	ii. Locking Leaver must disengage with little resistance. Burrs and other sources of resistance may be dressed-out.		
	iii. Locking Leaver must rotate smoothly about the locking leaver bushing. Replace bushing (p/n 79237-02), bushing (p/n 79237-01), bolt (p/n AN4-10A) if worn. iv. Engagement of the Locking Leaver into the Bearing Sleeve must prevent the cargo arm from pivoting about the Bearing Sleeve When locked, the cargo arm sideward motion limit at the furthest point from the bearing sleeve is +/- 0.25". If this motion is detected, inspect the Locking Leaver (p/n 79235-01) and Bearing Sleeve (p/n 79231-01) for wear. Replace worn part.		
	v. Touch up aluminum components with polyurethane paint as required following repairs.		
	c. Visually inspect Nylon Bushing (p/n 79233-01); a) Minimum wall thickness - 0.100in		
	b) If gouges are detected, inspect mating parts for burrs and contaminates. Replace nylon bushing if gouge exceeds minimum wall thickness allowable.		
	d. Visually inspect Nylon Bushing (p/n 79234-01). a) Minimum wall thickness - 0.100in		
	b) If gouges and detected, inspect mating parts for burrs and contaminates. Replace nylon bushing of gouge exceeds minimum wall thickness allowable.		

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DATA	INSPECTION TASK DESCRIPTION	INITIAL	
REFERENCE	AND COMPONENT REPAIR/REPLACE ORDERS	MECH	OTHER
DRAWING 79220	e. Visually inspect the Aluminum Cargo Arm (beam) for cracks, corrosion or other damage;		
	a) Flange and Stanchion Post Lugs - Nicks and/or gouges up to 0.063" deep and 0.125" wide may be dressed out to a smooth contour.		
	b) Web - Nicks and/or gouges up to 0.030" deep and 0.125" wide may be dressed out to a smooth contour.		
	c) Touch up with polyurethane paint as required following repairs.		
	f. Visually inspect the Bearing Sleeve for cracks, corrosion or other damage - Nicks and/or gouges up to 0.030" deep and 0.125" wide may be dressed out to a smooth contour.		
	g. Check all bolts for security and torque. Refer to Section 25-70		

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DATA	INSPECTION TASK DESCRIPTION	INIT	ΓIAL
REFERENCE	AND COMPONENT REPAIR/REPLACE ORDERS	MECH	OTHER
	RAPPEL STEP		
	DAILY INSPECTION		
DRAWING 79801	a. Inspect the attachment of the Rappel Step to the helicopter hardpoints.		
	300 HOUR/180 DAY INSPECTION		
DRAWING 79820	1. Rappel Step Assembly:		
	a. Visually inspect all components for cracks, corrosion or other damage. Aluminum parts - Nicks and/or gouges up to 0.063" deep and 0.25" wide may be dressed out to a smooth contour. Replace attachment hardware if worn.		
	b. Check all bolts for security and torque. Refer to Section 25-70.		

5-3 PROTECTIVE TREATMENT INFORMATION

1. Rappel Mount Provision

The Rappel Mount Provision is supplied painted white. If the paint is damaged, touch up with white polyurethane paint.

2. Cargo Deployment Arm

The Cargo Deployment Arm is supplied painted white. If the paint is damaged, touch up with white polyurethane paint.

3. Rappel Step

The Rappel Step is supplied painted white. If the paint is damaged, touch up with white polyurethane paint.

CHAPTER 11 - MARKINGS AND PLACARDS

The following markings and placards are used with the **Rappel Mount Provision Installation** in the locations noted:

Placards 75801-11 and 75801-12 to be in clear view of the pilot

AIRCRAFT MUST BE IN HOVER FOR RAPPEL OPERATIONS

Placard 75801-11

RAPPEL OPERATIONS DURING VFR CONDITIONS ONLY

Placard 75801-12

Placard 75801-13 to be attached to Rappel Mount Provision in clear view of the load master.

MAXIMUM RAPPEL MOUNT CAPACITY 350 LBS (158 KG)

Placard 75801-13

The following markings and placards are used with the **Cargo Deployment Arm Installation** in the locations noted:

Placards 79201-11 and 79201-12 to be in clear view of the pilot

AIRCRAFT MUST BE IN HOVER FOR CARGO DEPLOYMENT OPERATIONS

Placard 79201-11

CARGO DEPLOYMENT OPERATIONS DURING VFR CONDITIONS ONLY

Placard 79201-12

Placard 79201-13 to be attached to Cargo Deployment Arm in clear view of the load master.

MAXIMUM CARGO DEPLOYMENT ARM CAPACITY 250 LB (113.3 KG)

Placard 79201-13

Placarding is not required for the Rappel Step Installation.

CHAPTER 25 – EQUIPMENT AND FURNISHINGS

25-60 - RAPPEL MOUNT PROVISION

The Rappel Mount Provision Installation may be applied to the right and/or left side of the helicopter.

25-61 RAPPEL MOUNT PROVISION - REMOVAL

REFER TO DRAWINGS 75801 AND 75820

- 1. Remove bearing clips and the associated bearing clip fastening hardware from the stanchion adapter (Figure 25-61-01).
- Unlock the rappel mount provision stud fittings from the helicopter roof tiedown studs and stanchion post adapter from the helicopter floor tiedown stud.
- 3. Remove the AN4 (stanchion) bolt, AN960-416 washers (x2) and MS20365-428 locknut.
- 4. Slide the stanchion adapter into the stanchion post and remove the stanchion post and rappel mount provision from the helicopter.
- 5. Remove the rappel mount provision from the stanchion post.

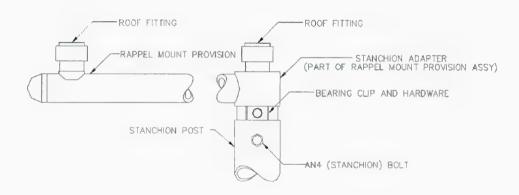


Figure 25-61-01

25-62 RAPPEL MOUNT PROVISION - INSTALLATION

REFER TO DRAWINGS 75801 AND 75820

- Remove the existing stanchion adapter from the helicopter stanchion post.
- 2. Slide the stanchion adapter of the rappel mount provision assembly into the stanchion post.
- 3. Align the stanchion adapter slot and stanchion post bolt hole.

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4. Position the rappel mount provision and stanchion post into the helicopter. Position and lock the stud fittings onto the helicopter roof tiedown studs and the stanchion adapter onto the helicopter floor tiedown stud. See Aero Design Drawing 75801 for position details.

- 5. Install the bearing clips and the associated bearing clip hardware into the stanchion adapter. NOTE: The bearing clip must contact the stanchion post as shown (Figure 25-61-01).
- 6. Install the AN4 (stanchion) bolt, AN960-416 washers (x2) onto stanchion post and stanchion adapter. Secure with the MS20365-428 locknut.

25-63 CARGO DEPLOYMENT ARM

The Cargo Deployment Arm Installation may be applied to the right and/or left side of the helicopter.

25-64 CARGO DEPLOYMENT ARM - REMOVAL

REFER TO DRAWINGS 75820, 79201 AND 79220

- 1. Remove the bearing clips and associated bearing clip fastening hardware from the stanchion adapter (Figure 25-64-01).
- 2. Unlock the rappel mount provision stud fittings from the helicopter roof tiedown studs and stanchion post adapter from the helicopter floor tiedown stud.
- 3. Remove the AN4 (stanchion) bolt, AN960-416 washers (x2) and MS20365-428 locknut.
- 4. Slide the stanchion adapter into the stanchion post and remove the stanchion post, cargo deployment arm and rappel mount provision from the helicopter.
- 5. Slide the rappel mount provision out of the stanchion post.
- 6. Slide the cargo deployment arm assembly off the stanchion post.

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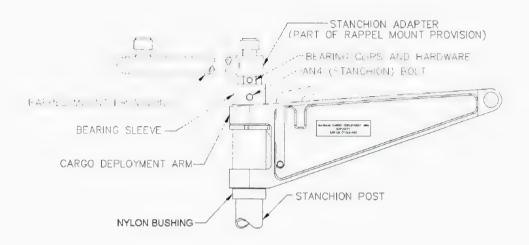


Figure 25-64-01

25-65 CARGO DEPLOYMENT ARM - INSTALLATION

REFER TO DRAWINGS 75820, 79201 AND 79220

1. Remove the existing stanchion adapter and upper pad from the helicopter stanchion post.



THE LHS SIDEWARD FACING SEATS MUST BE REMOVED WHEN INSTALLING THE CARGO DEPLOYMENT ARM ON THE LHS OF THE HELICOPTER.

THE RHS SIDEWARD FACING SEATS MUST BE REMOVED WHEN INSTALLING THE CARGO DEPLOYMENT ARM ON THE RHS OF THE HELICOPTER.

- 2. Slide the cargo arm assembly onto the stanchion post. Align the bearing sleeve, nylon sleeve and stanchion post bolt holes.
- 3. Slide the stanchion adapter of the rappel mount provision assembly into the stanchion post.
- 4. Align the stanchion adapter slot with the stanchion post bolt hole.

5. Install the AN4 (stanchion) bolt, AN960-416 washers (x2) onto the cargo arm, stanchion post and stanchion adapter. Secure loosely with the MS20365-428 locknut.

- Position the rappel mount provision and stanchion post into the helicopter.
 Position and lock the stud fittings onto the helicopter roof tiedown studs and
 the stanchion adapter onto the helicopter floor tiedown stud. See Aero
 Design Drawing 79201 for position details.
- 7. Install the bearing clips and the associated bearing clip hardware into the stanchion adapter. NOTE: The bearing clip must contact the stanchion post as shown (Figure 25-64-01).
- 8. Secure the AN4 (stanchion) bolt. See Section 25-70 for Torque Values.

25-66 RAPPEL STEP

The Rappel Step Installation may be applied to the right and/or left side of the helicopter.

25-67 RAPPEL STEP - REMOVAL

REFER TO DRAWINGS 79801 and 79820

- 1. Remove the AN5 bolts (x2), AN960-516 washers (x2) and MS20365-524 locknuts (x2) from the mounting plate and the helicopter hardpoints at Fuselage Station 84.46.
- 2. Remove the AN4 bolts (x2), AN960-416 washers (x2) and MS20365-428 locknuts (x2) from the mounting plate and the helicopter hardpoints at Fuselage Station 129.00.
- 3. Remove the Rappel Step from the helicopter.

25-68 RAPPEL MOUNT PROVISION - INSTALLATION

REFER TO DRAWINGS 79801 and 79820

- 4. Align the rappel step bolt holes with the pairs of helicopter hardpoints at Fuselage Station 84.46 and 129.00. Ensure the rappel step mounting plates are on the forward side of the helicopter hardpoints.
- 5. Install the AN4 bolts (x2), through the pair of helicopter hardpoints and mounting plate at Fuselage Station 129.00. Secure with AN960-416 washers (x2) and MS20365-428 locknuts (x2).
- 6. Install the AN5 bolts (x2), through the pair of helicopter hardpoints and mounting plate at Fuselage Station 84.46. Secure with AN960-516 washers (x2) and MS20365-524 locknuts (x2).

25-69 WEIGHT AND BALANCE

Rappel Mount Provision Installation			Longitudinal		Lateral	
Part #	Name	Weight (lbs)	Arm (in)	Moment (in-lbs)	Arm (in)	Moment (in-lbs)
75801-01	Rappel Mount Provision Installation LHS	7.63	120.4	918.6	-39.5	-301.4
75801-02	Rappel Mount Provision Installation RHS	7.63	120.4	918.6	39.5	301.4

Cargo Deployment Arm Installation			Longitudinal		Lá	ateral
		Weight	Arm	Moment	Arm	Moment
Part #	Name	(lbs)	(in)	(in-lbs)	(in)	(in-lbs)
	Cargo Deployment Arm					
79201-01	Installation LHS	4.6	135.3	622.4	-39.5	~181.7
	Cargo Deployment Arm					
79201-02	Installation RHS	4.6	135.3	622.4	39.5	181.7

Note: The Cargo Deployment Arm must be installed with the Rappel Mount Provision. Weight and balance data for the Cargo Deployment Arm does not include the weight and balance data for the Rappel Mount Installation. The weight and balance data for the removal of sideward facing seats not included.

Rappel Step Installation			Longitudinal		Lateral	
		Weight	Arm	Moment	Arm	Moment
Part #	Name	(lbs)	(in)	(in-lbs)	(in)	(in-lbs)
79801-01	Rappel Step Installation LHS	9.5	105.22	999.58	-45.18	-429.20
79801-02	Rappel Step Installation RHS	9.5	105.22	999.58	45.18	429.20

Note: Lateral arms are given for right side installation. For installation on left side, lateral arms are negative.

25-70 STRUCTURAL FASTENER DATA

TORQUE VALUE CHART (DRY) FOR ALL FASTENERS

FASTENER DIAMETER/ THREAD SIZE	RECOMMENDED STANDARD TORQUE RANGE
10 - 32	20 to 25 in-lb
1/4 - 28	50 to 70 in-lb
5/16 - 24	100 to 140 in-lb
3/8 - 24	160 to 190 in-lb

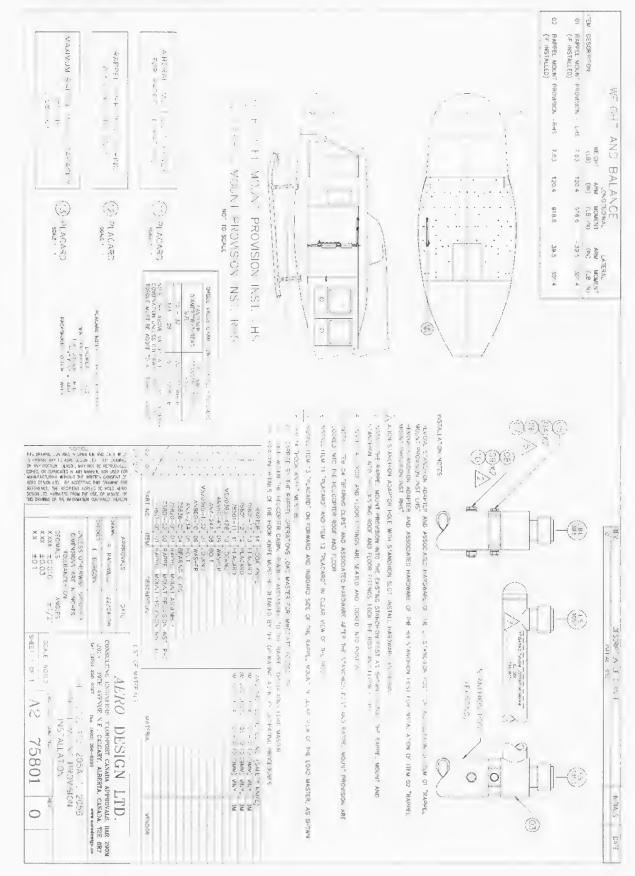
NOTE: The above values apply to any fastener combination unless otherwise specified. Tare torque must be added to all torque values.

APPENDIX A - REFERENCE DRAWINGS

Revision 1 APPENDIX A
Page 24

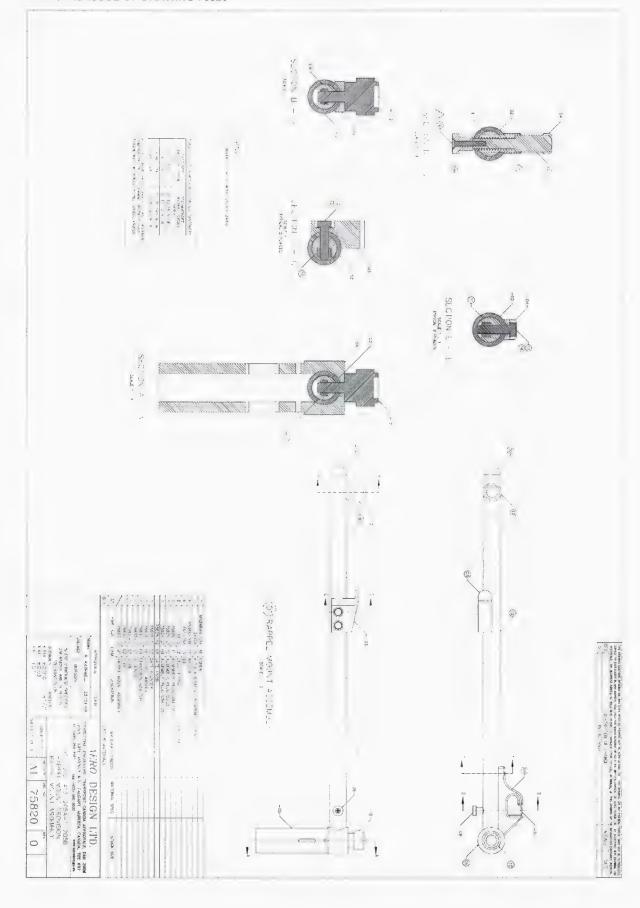
Drawing 75801 - Rappel Mount Provision Installation

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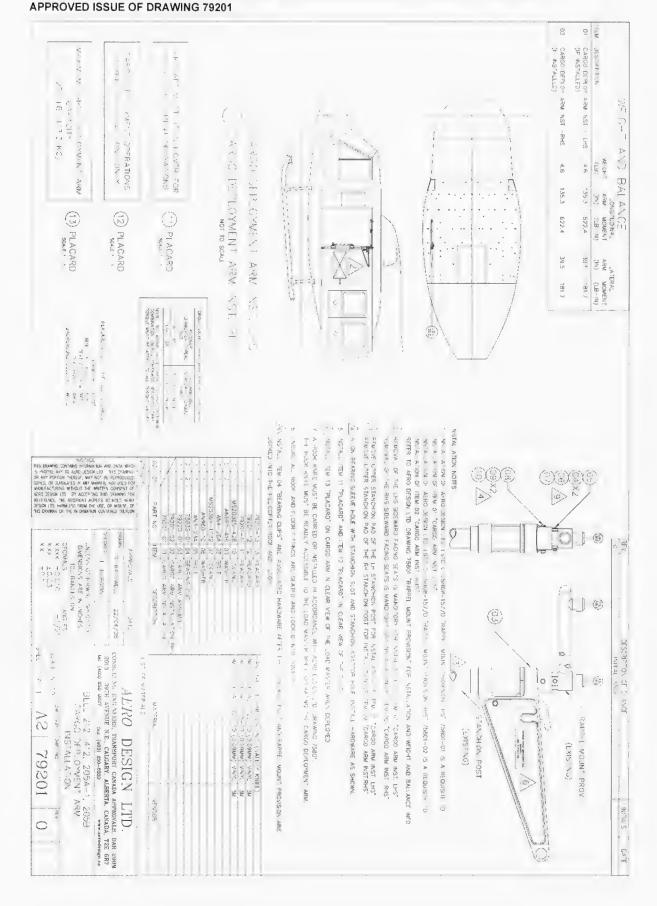


Drawing 75820 – Rappel Mount Provision Assembly

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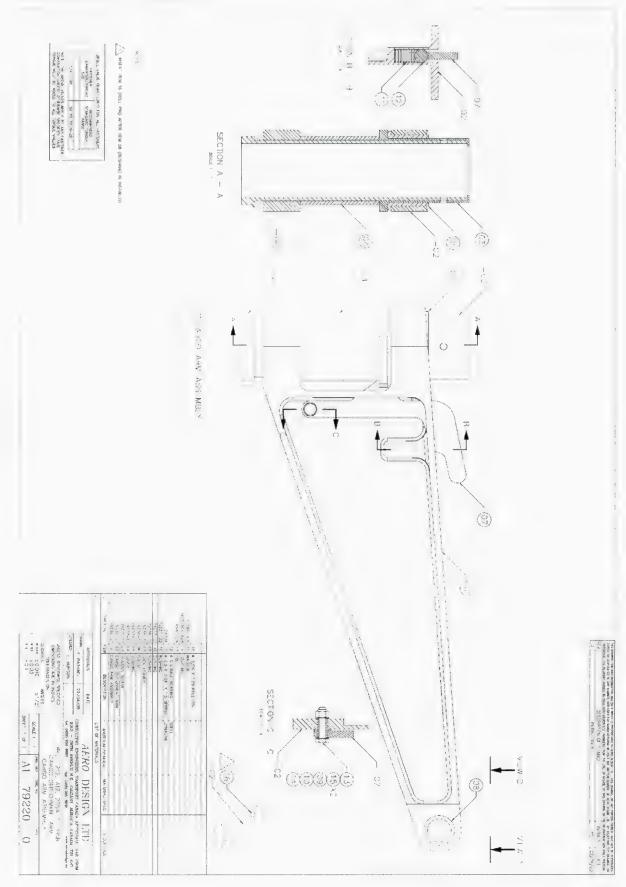


Drawing 79201 – Cargo Deployment Arm Installation
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Drawing 79220 - Cargo Deployment Arm Assembly

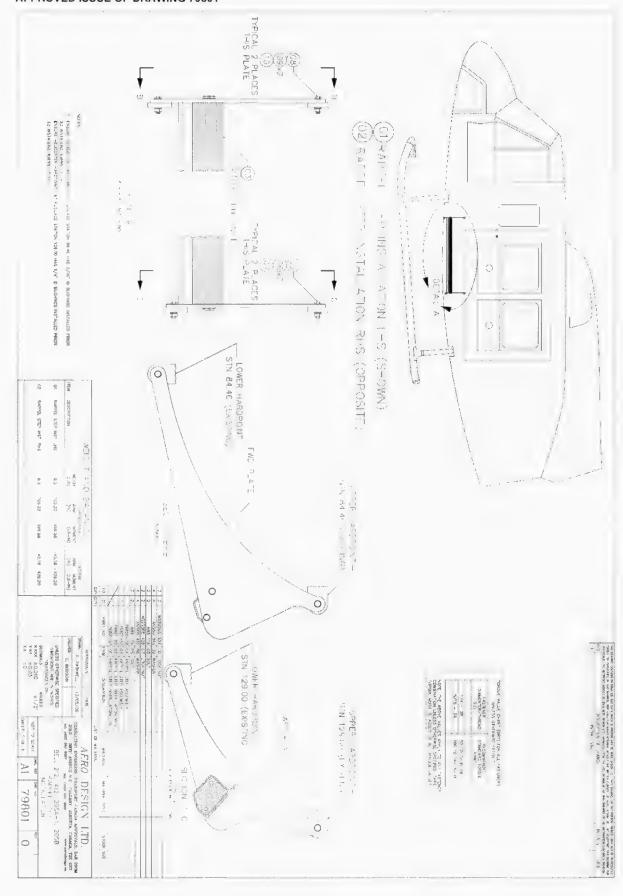
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Revision 1

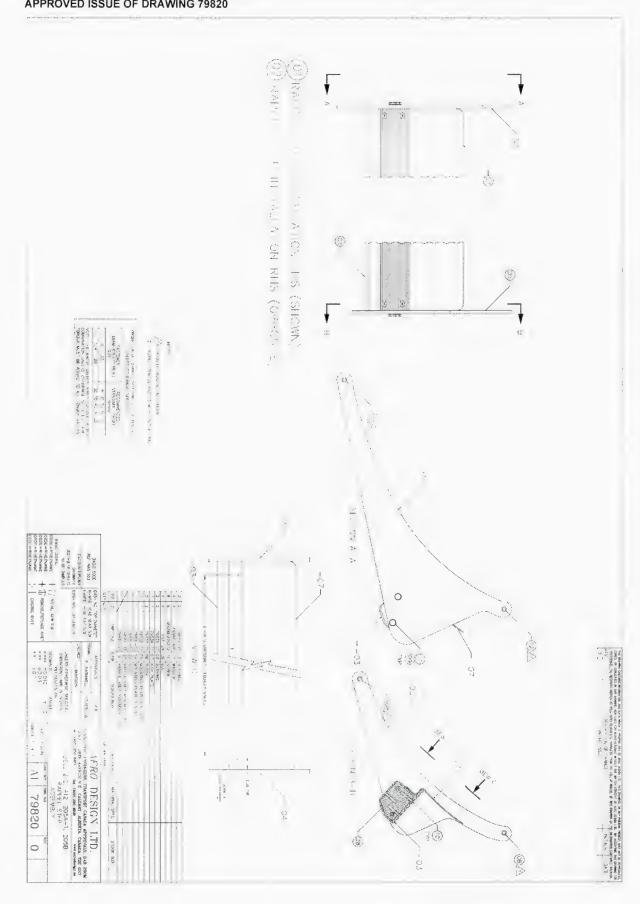
Drawing 79801 - Rappel Step Installation

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Drawing 79820 – Rappel Step Assembly

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AERO Design Ltd.

ENGINEERING REPORT ER758.01

Rappel Mount Provision

Bell 412, 212, 205A-1, 205B

Approved by: E. Burgoin, P. Eng.

Prepared by: Richard Rathwell

Revision 0 Date: 08 April, 2008

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1.0 INTRODUCTION

This document will show elements the installation of the Rappel Mounting Provision and the Cargo Deployment Arm are in compliance with Federal Aviation Regulations detailed in the Aero Design Ltd. Document CP758-1, *Compliance Program* and Aero Design Ltd. Document CP758-2, *Compliance Program*

The installation provides an aircraft mount for rappelling operations and cargo deployment operations by trained personnel (ie. rappelling fire fighters).

2.0 REFERENCE

AERO Design Ltd. Drawing 75801 Rappel Mount Provision

AERO Design Ltd. Drawing 79201 Cargo Deployment Arm

AERO Design Ltd. Drawing 79801 Rappel Step

AERO Design Ltd. Document CP758-01 Compliance Program

AERO Design Ltd. Document CP758-02 Compliance Program

AERO Design Ltd. Document CP798 Compliance Program

Bell Helicopters RPT-205-099-205

USAAVLABS Technical Report 70-22, Crash Survival Design Guide

USAAVSCOM Technical Report 89-D-22B Aircraft Crash Survival Design Guide, Volume II

Analysis and Design of Flight Vehicle Structures, Bruhn

Fluid Dynamic Drag, Hoerner

MIL-STD-1472D, Human Engineering Design Criteria for Military Systems, Equipment and Facilities

3.0 BASIS OF CERTIFICATION

Bell 412: FAR Part 29 dated 1 February 1965, Amendment 29-1 and 29-2

Bell 212: FAR Part 29 dated 1 February 1965, Amendment 29-1 and 29-2

Bell 205A-1: CAR 7 dated August 1, 1956, Amendments 7-1 through 7-4

Bell 205B: CAR 7 dated August 1, 1956, Amendments 7-1 through 7-4

This installation: FAR Part 29 dated 1 February 1965, Amendment 29-1 and 29-2 and Amendment 29-43 for 29.865(a) and 29.865(e)

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4.0 ANALYSIS OF CURRENT AIRWORTHINESS DIRECTIVES (AD'S)

There are no current AD's related to this project. Refer to appendix A of this document for a list of current AD's.

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5.0 STRUCTURAL ANALYSIS - RAPPEL MOUNT PROVISION

5.1 Loads and Factors

Weight of Rappeller: Maximum weight of rappeller per FMS Limitation W_{rap} := 350-16f

Human External Load Factor:

Per 29.865(a)

 $n_{1f} := 3.5$

Safety Factor:

Per 29.303

 $n_{sf} = 1.5$

Fitting Factor:

Per 29.625

 $n_{ff} := 1.15$

Limit Downward Load Factor:

$$n_{v_lim} := n_{lf} \cdot n_{ff}$$

 $n_{v_lim} = 4.02$

Limit Downward Load of Rappeller on the Rope:

$$P_{\texttt{rap_lim}} \coloneqq W_{\texttt{rap}} \cdot n_{\texttt{v_lim}}$$

 $P_{rap_lim} = 1408.71bf$

Ultimate Downward Load Factor:

$$\mathbf{n}_{\text{v_ult}} \coloneqq \mathbf{n}_{\text{lf}} \cdot \mathbf{n}_{\text{sf}} \cdot \mathbf{n}_{\text{ff}}$$

 $n_{v_ult} = 6.04$

Ultimate Downward Load of Rappeller on the Rope:

$$P_{rap_ult} \coloneqq W_{rap} \cdot n_{v_ult}$$

 $P_{rap_ult} = 2113.11bf$

5.2 Reactions

Reactions - At Rope Guide (See Figure 5.2.1)

$$R_{\tt guide_lim} \coloneqq \frac{P_{\tt rap_lim}}{\sin[(90-12)\cdot \deg]}$$

The limit load case is used only for analyzing the combined loads on the rappel tube.

$$R_{guide_lim} = 1440.21bf$$

$$R_{guide} \coloneqq \frac{P_{rap_ult}}{sin[(90 - 12) \cdot deg]}$$

Ultimate load case

R_{h_guide} = 449.21bf

$$R_{h_guide} := R_{guide} \cdot \sin(12 \cdot \deg)$$

Reactions - Sill

$$R_{sill} = R_{h_guide}$$

$$R_{sill} = 449.21bf$$

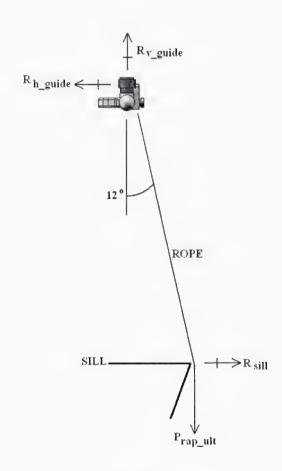


Figure 5.2.1

Reactions - Aircraft Roof Fittings

Roof Fitting Allowables Per Bell Helicopters RPT-205-099-205:

Floor Fitting 30 - Vertical:	$F_{xx} = EE_{20} := 2150 \cdot 10f$

Floor Fitting 30 - Longitudinal:
$$F_{long FF30} := 2150 \cdot lbf$$

Floor Fitting 30 - Lateral:
$$F_{lat_FF30} := 2150 \cdot lbf$$

Roof Fitting 5 - Vertical:
$$F_{v RF5} = 0.1bf$$

Roof Fitting 5 - Longitudinal:
$$F_{long, RF5} := 1250 \cdot lbf$$

Roof Fitting 5 - Lateral:
$$F_{lat RF5} = 1250 \cdot lbf$$

Roof Fitting 3 - Vertical:
$$F_{v_RF3} = 1500 \cdot lbf$$

Roof Fitting 3 - Longitudinal:
$$F_{long_RF3} := 0.16f$$

Roof Fitting 3 - Lateral loading allowable has been rationalized with the following assumption:

Bell Helicopters Report 205-099-205 states that roof fitting #3 has an ultimate vertical load allowable of 1500 lbf. A lateral load allowable for roof fitting #3 has not been expressed for reasons unknown.

The position of this document is that an analysis of the roof fitting for a 1500 lbf lateral load, coupled with the defined vertical load allowable note above, would provide sufficient data to know the load allowable for any angle within the vertical-lateral plane.

Lateral load for analysis:

 $P_{1at} := 1500 \cdot 1bf$

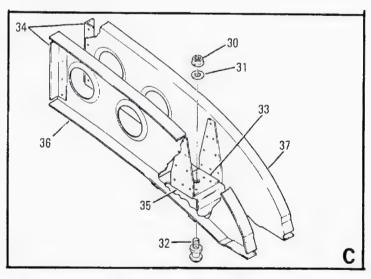


Figure 5.2.2 - Roof Fitting #3, Including Lateral Frames

Analysis of fitting plate bearing strength:

Plate thickness t_{plate} := 0.090-in

Diameter of hole $D_{plate} := 0.375 \cdot in$

Bearing Area:

$$A_{plate_br} := t_{plate} \cdot D_{plate}$$

$$A_{plate_br} = 0.034 \text{ in}^2$$

Stress:

$$\sigma_{\text{plate}} \coloneqq \frac{P_{\text{lat}}}{A_{\text{plate br}}}$$
 $\sigma_{\text{plate}} = 44 \, \text{ksi}$

Material Prop. 2024-T3 (bearing) F_{bru 2024} := 104·ksi

Margin of Safety:

$$MS_{\sigma_plate} := \frac{F_{bru_2024}}{\sigma_{plate}} - 1$$

$$MS_{\sigma_plate} = 1.3$$

MARGIN OF SAFETY IS POSITIVE

Analysis of fitting in shear:

Plate height $h_{plate} := 0.090 \cdot in$

Plate Length 1_{plate} := 1.625·in

Shear Area (2 sides)

$$A_{plate_s} := 2 (h_{plate} \cdot l_{plate})$$

$$A_{plate_s} = 0.29 \text{ in}^2$$

Stress:

$$\tau_{\text{plate}} := \frac{P_{\text{lat}}}{A_{\text{plate}_s}}$$

$$\tau_{\text{plate}} = 5.13 \, \text{ksi}$$

Material Prop. 2024-T3 (shear) $F_{su 2024} = 39 \cdot ksi$

Margin of Safety:

$$MS_{\tau_plate} := \frac{F_{su_2024}}{\tau_{plate}} - 1$$

$$MS_{\tau_plate} = 6.6$$

MARGIN OF SAFETY IS POSITIVE

Analysis of rivets:

Centrod:

(estimated by finding the average distance of the rivets from the base of the fitting bracket)

	DISTANCE			
RIVET	FROM			
	BASE (IN)			

Α	3.41
В	2.375
С	2.375
D	1.437
E	1.437
F	0.45
Н	0.45
G	0.45

SUM OF DIST= 12.384 IN

AVG DIST OVER 8 RIVETS= 1.548 IN

(ESTIMATED CENTROID LOCATION FROM BASE)

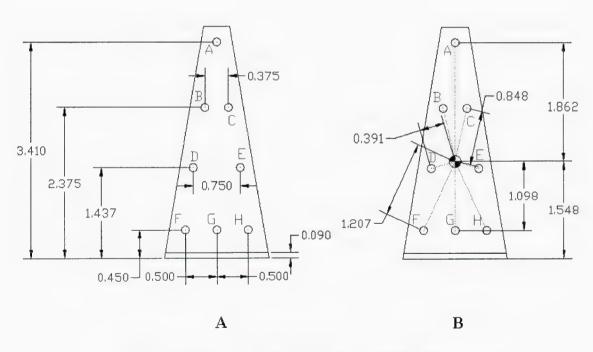


Figure 5.2.3 - Roof Fitting Bracket, Dimensions

Figure 5.2.4 shows the resolved reactions at each fitting (1500 lbf / 8 fittings and eccentric load applied to each fitting)

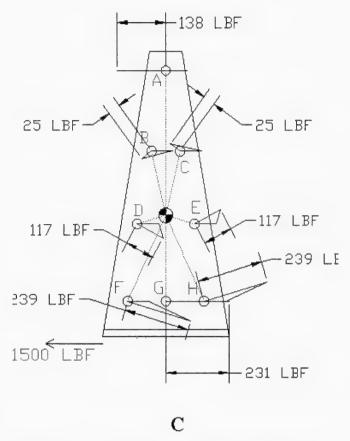


Figure 5.2.4 - Roof Fitting Bracket - Reactions

Eccentric Load Analysis, From Bruhn;

	D	D^2	M	1	F
	DISTANCE		MOMENT AT		FORCE
	FROM		CENTROID		$M \times D / I$
			1500# X		
RIVET	CENTROID (IN)	DIST ²	1.55IN	I (IN ²)	(LBF)
Α	1.862	3.47	1162.5	9.33	232
В	0.848	0.72	1162.5	9.33	106
С	0.848	0.72	1162.5	9.33	106
D	0.391	0.15	1162.5	9.33	49
E	0.391	0.15	1162.5	9.33	49
F	1.206	1.45	1162.5	9.33	150
Н	1.206	1.45	1162.5	9.33	150
G	1.098	1.21	1162.5	9.33	137

SUM OF DIST², I = 9.33 IN^2

The critical load is at rivet "F" and "H" (equal)

Priv critical = 239-16f

Material Prop. 1/8 "AD4" Rivet (shear)

 $F_{su AD4} := 389 \cdot 1bf$

Margin of Safety:

$$MS_{riv_critical} := \frac{F_{su_AD4}}{P_{riv_critical}} - 1$$

MARGIN OF SAFETY IS POSITIVE

Analysis of Lateral Frame

Material Prop. of Lateral Frame:

Bearing Strength, 2024-T3

F_{bru_2024} := 104·ksi

Thickness

 $T_{frame} := 0.025 \cdot in$

Diameter of Rivet Hole (AD4 No. 30 Drill)

 $D_{AD4} := 0.1285 \cdot in$

Bearing Area:

$$A_{br_frame} := D_{AD4} \cdot T_{frame}$$

$$A_{br_frame} = 0.0032 in^2$$

Stress:

$$\sigma_{\text{frame}} \coloneqq \frac{P_{\text{riv_critical}}}{A_{\text{br_frame}}}$$

Margine of Safety:

$$MS_{frame} := \frac{F_{bru}_{2024}}{\sigma_{frame}} - 1$$

MARGIN OF SAFETY IS POSITIVE

The lateral frames for roof fitting #3 are identical to the lateral frames for roof fitting #5 and #6. These frames are similar in material type, thickness, general shape and attachment to the same cabin roof longitudinal frame assembly. Roof fitting #5 and #6 share a single pair of lateral frames, with a combined lateral ultimate load allowable of 2500 lbf. Therefore, by comparison, the lateral frames are sufficient to carry the 1500 lbf ultimate lateral load. Furthermore, the cabin roof longitudinal frame assembly would also carry the 1500 lbf ultimate lateral load by the same comparison. See Figure 5.2.5.

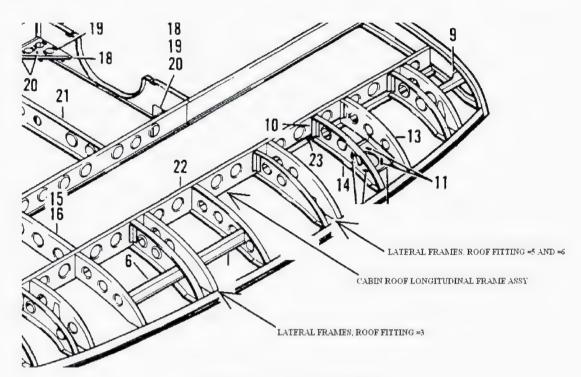


Figure 5.2.5 - Roof Assembly

Vertical Reactions (See Figure 5.2.6)

Assumption: Floor Fitting 30 and Roof Fitting 3 take all vertical loads.

Roof Fitting 3

$$R_{v_RF3} \coloneqq \frac{R_{v_guide} \cdot 18.0 \cdot in}{25.9 \cdot in}$$

 $R_{v_RF3} = 1468.61bf$

Margin of Safety:

$$\text{MS}_{\text{v_RF3}} \coloneqq \frac{\text{F}_{\text{v_RF3}}}{\text{R}_{\text{v_RF3}}} - 1$$

 ${\rm MS_{v_RF3}} = 0.021$

MARGIN OF SAFETY IS POSITIVE

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Floor Fitting 30

$$R_{v_FF30} := \frac{R_{v_guide} \cdot 7.9 \cdot in}{25.9 \cdot in}$$
 $R_{v_FF30} = 644.51bf$

Margin of Safety:

$$MS_{v_FF30} := \frac{F_{v_FF30}}{R_{v_FF30}} - 1$$
 $MS_{v_FF30} = 2.336$

MARGIN OF SAFETY IS POSITIVE

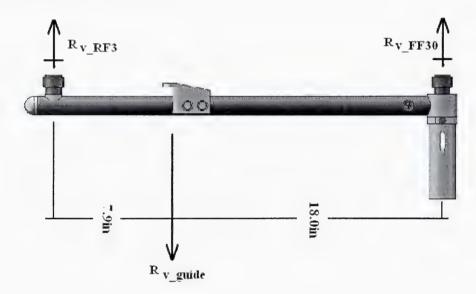


Figure 5.2.6

Stanchion Compression:

$$OD_{stan} := 2.0 \cdot in$$

$$ID_{stan} := 1.75 \cdot in$$

Area - Stanchion

$$\mathbf{A}_{stan} := \left(\frac{\mathbf{OD}_{stan}}{2}\right)^2 \cdot \pi - \left(\frac{\mathbf{ID}_{stan}}{2}\right)^2 \cdot \pi$$

$$A_{stan} = 0.7 \, \text{in}^2$$

Stress:

$$\sigma_{stan_comp} \coloneqq \frac{R_{v_FF30}}{A_{stan}}$$

$$\sigma_{\rm stan~comp} = 0.9 \, \rm ksi$$

Horizontal Reactions (See Figure 5.2.7)

Assumption: Roof Fitting 3 and Roof Fitting 5 take all horizontal loads

Roof Fitting 3

$$R_{\mbox{\scriptsize lat_RF3}} \coloneqq \frac{R_{\mbox{\scriptsize h_guide}} \cdot 18.0 \cdot \mbox{\scriptsize in}}{25.9 \cdot \mbox{\scriptsize in}}$$

$$R_{lat_RF3} = 312.21bf$$

Margin of Safety:

$$\text{MS}_{\mbox{\scriptsize lat_RF3}} := \frac{F_{\mbox{\scriptsize lat_RF3}}}{R_{\mbox{\scriptsize lat_RF3}}} - 1$$

$$MS_{1at_RF3} = 3.8$$

Roof Fitting 5

$$R_{\text{lat_RF5}} = \frac{R_{\text{h_guide}}.7.9 \cdot \text{in}}{25.9 \cdot \text{in}}$$

 $R_{\rm lat_RF5} = 137\,\rm lbf$

Margin of Safety

$$MS_{lat_RF5} := \frac{F_{lat_RF5}}{R_{lat_RF5}} - 1$$

$$MS_{lat_RF5} = 8.1$$

MARGIN OF SAFETY IS POSITIVE

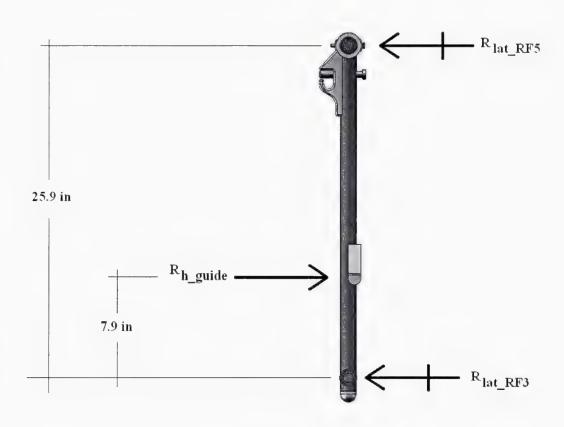


Figure 5.2.7

Reaction - Roof Attach Fittings

Mechanical Properties of 33115 Roof Attach Fitting - per manufacturer specs. (See Appendix C)

$$F_{v=33115} := 5475 \cdot 1bf$$

 $F_{lat 33115} := 2300 \cdot 10f$

Margin of Safety (vertical):

$$MS_{v_33115} := \left(\frac{F_{v_33115}}{R_{v_RF3}}\right) - 1$$

$$MS_{v_1 33115} = 2.7$$

MARGIN OF SAFETY IS POSITIVE

Margin of Safety (lateral):

$$MS_{lat_33115} := \left(\frac{F_{lat_33115}}{R_{lat_RF3}}\right) - 1$$

Critical Case

$$MS_{lat 33115} = 6.37$$

MARGIN OF SAFETY IS POSITIVE

Reaction - Tube Bending (See Figure 5.2.8).

Combined stresses occur on the rappel tube as a result of normal operation.

Figure 5.2.8 "A" shows of a moment reaction on rappel tube.

Figure 5.2.8 "B" shows the rappel tube in compression.

Figure 5.2.8 "C" shows the rappel tube in bending.

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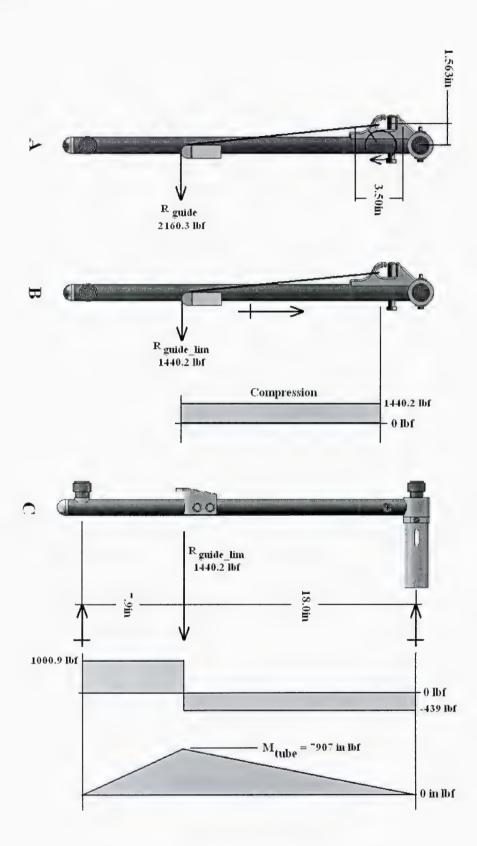


Figure 5.2.8

Moment Reaction through aft bolt (figure 5.2.8 "A"):

$$R_{AN5} := \frac{R_{guide} \cdot 1.563 \cdot in}{3.5 \cdot in}$$
 $R_{AN5} = 964.7 \text{ lbf}$

Margin of Safety:

$$MS_{AN5} := \frac{F_{AN5}}{R_{AN5}} - 1$$
 $MS_{AN5} = 6$

MARGIN OF SAFETY IS POSITIVE

Compression (figure 5.2.8 "B"):

Area - Tube
$$A_{tube} := 0.544 \cdot in^2$$

Stress:

$$\sigma_{\text{tube_comp}} := \frac{R_{\text{guide_lim}}}{A_{\text{tube}}}$$
 $\sigma_{\text{tube_comp}} = 2.6 \, \text{ksi}$

Bending Moment (figure 5.2.8 "C"):

$$M_{tube} := \frac{R_{guide_lim} \cdot 7.9 \cdot in}{25.9 \cdot in} \cdot 18 \cdot in$$

$$M_{tube} = 7907.3 in \cdot 1bf$$

Stress:

$$\sigma_{\text{tube_bend}} := \frac{M_{\text{tube}} \cdot c_{\text{tube}}}{I_{\text{tube}}}$$

$$\sigma_{\text{tube_bend}} = 61.8 \text{ ksi}$$

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Combined Stresses within the tube occur at the rope guide:

$$\sigma_{combined} = \sigma_{tube_bend} + \sigma_{tube_comp}$$

$$\sigma_{combined} = 64.423 \, \text{ksi}$$

Mechanical Properties of 4130N Steel Per MMPDS-01

$$F_{\text{cy_4130N}} := 75 \cdot \text{ksi}$$

Margin of Safety:

$$MS_{tube} := \left(\frac{F_{cy_4130N}}{\sigma_{combined}}\right) - 1$$

$$MS_{tube} = 0.2$$

MARGIN OF SAFETY IS POSITIVE

DATA FOR THE ULTIMATE LOAD CASE IS NOT AVAILABLE. THE TEST DETAILED IN PARAGRAPH 5.3 VARIFIES THE STRUCTURE OF THE INSTALLATION AT THE ULTIMATE LOAD CASE.

5.3 Structural Test

A structural test was conducted to simulate a limit and ultimate load onto Rappel Mount Provision. This test was conducted to support the structural analysis findings of this document.

The test set-up applied loads at 12 degrees off-vertical and used the same aircraft roof fitting hardware to mount the tube assembly (see Figure 5.3.1 and Figure 5.3.2)

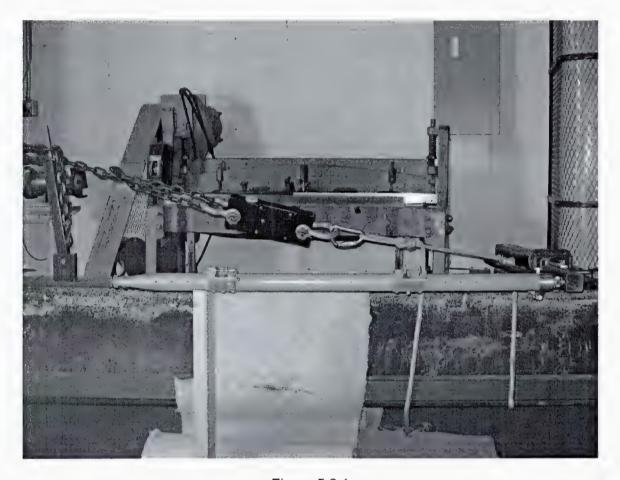


Figure 5.3.1

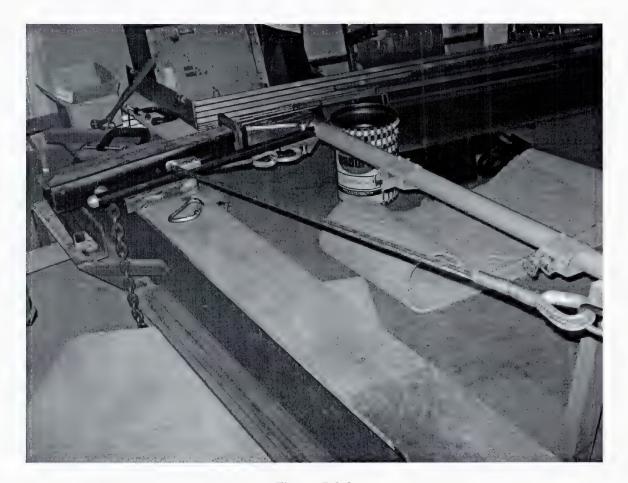


Figure 5.3.2

The test loaded the tube assembly to above limit load (See Figure 5.3.3):

Limit load (resolved load at 12deg) = 1253lbf Test Limit Load = 1280lbf

The tube assembly showed no signs of permanent deformation.

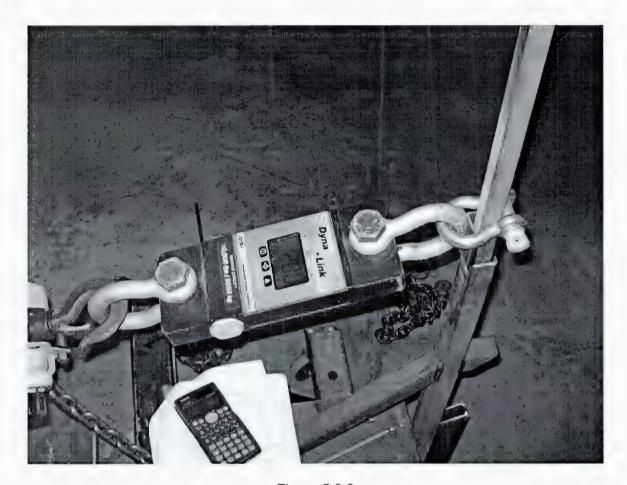


Figure 5.3.3

The test loaded the tube assembly to above ultimate load (See Figure 5.3.4):

Ultimate load (resolved load at 12 deg) = 1880lbf Test Ultimate Load = 1890lbf

The tube assembly showed no signs of permanent deformation.

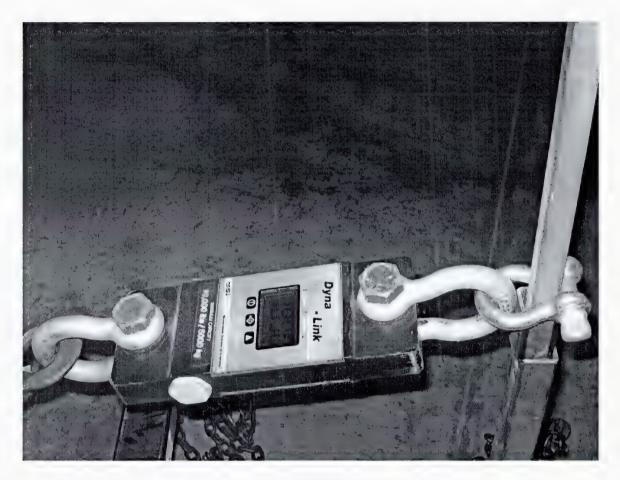


Figure 5.3.4

Results: This test supports the engineering finding in this report.

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6.0 STRUCTURAL ANALYSIS - CARGO DEPLOYMENT ARM

6.1 Loads and Factors

Weight of Cargo: Maximum weight of Cargo per FMS Limitation W_{car} := 250-1bf

External Load Factor: Per AERO Design Ltd. $n_{AD} := 3.0$

Note: this load factor exceeds FAR

29.865 of 2.5

Safety Factor: Per 29.303 $n_{sf} := 1.5$

Fitting Factor: Per 29.625 $n_{\text{ff}} := 1.15$

Limit Downward Load Factor:

 $n_{v_lim} = n_{AD} \cdot n_{ff}$ $n_{v_lim} = 3.45$

Limit Downward Load of Suspended Cargo:

 $P_{car_lim} = W_{car} \cdot n_{v_lim} = 862.51bf$

Ultimate Downward Load Factor:

 $n_{v_ult} := n_{AD} \cdot n_{sf} \cdot n_{ff}$ $n_{v_ult} = 5.17$

Ultimate Downward Load of Suspended Cargo:

 $P_{car_ult} \coloneqq W_{car} \cdot n_{v_ult} = 1293.8 \, lbf$

6.2 Reactions

Lug Strength Analysis Under Transverse Loading (See Figure 6.2.1)

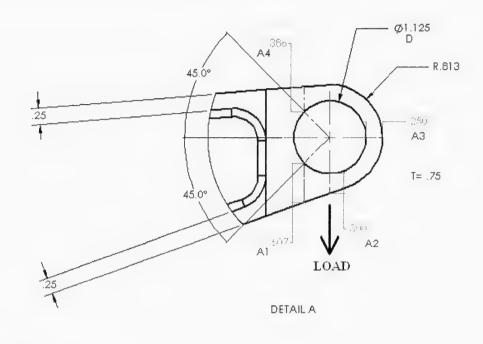




Figure 6.2.1

From Figure 6.2.1

$$t := 0.75 \cdot in$$

$$D := 1.125 \cdot in$$

$$A1 := t \cdot 0.607 \cdot in$$

$$A2 := t \cdot 0.300 \cdot in$$

$$A3 := t \cdot 0.250 \cdot in$$

$$A4 := t \cdot 0.386 \cdot in$$

$$A_{av} := \frac{6}{\frac{3}{A1} + \frac{1}{A2} + \frac{1}{A3} + \frac{1}{A4}}$$

$$A_{hr} := D \cdot t$$

$$\frac{A_{av}}{A_{hr}} = 0.359$$

Use Curve 10, Therefore

$$P_{tu} := K_{tu} \cdot A_{br} \cdot F_{tu_6061}$$

From Bruhn, D1.12:

Margin of Safety:

$$\text{MS} \coloneqq \frac{P_{tu}}{P_{car_ult}} - 1$$

$$A1 = 0.455 \, \text{in}^2$$

$$A2 = 0.225 \, \text{in}^2$$

$$A3 = 0.187 \, \text{in}^2$$

$$A4 = 0.289 \, \text{in}^2$$

$$A_{av} = 0.303 \, \text{in}^2$$

$$A_{br} = 0.844 \, \text{in}^2$$

$$K_{tii} := 0.343$$

$$F_{tu_6061} := 42 \cdot ksi$$

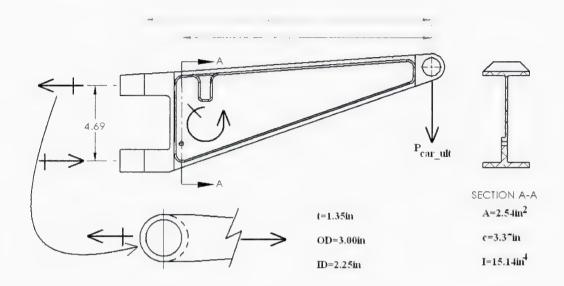
$$P_{tin} = 121551bf$$

MARGIN OF SAFETY IS POSITIVE

Bending of the Cargo Arm (see Figure 6.2.2)

Note: Bending analysis at location where the M/I ratio is the greatest.

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Moment of Inertia

Centroid

$$M_{arm} \coloneqq 15.66 \cdot in \cdot P_{car_ult}$$

Bending Moment

$$c_{arm} := 3.37 \cdot in$$

$$M_{arm} = 20260.1 in \cdot 1bf$$

Stress

$$\sigma_{arm} := \frac{M_{arm} \cdot c_{arm}}{I_{arm}}$$

$$\sigma_{arm} = 4.5 \, \text{ksi}$$

Margin of Safety:

$$MS = \frac{F_{tu_6061}}{\sigma_{arm}} - 1$$

$$MS = 8.3$$

MARGIN OF SAFETY IS POSITIVE

Reactions at Stanchion Lugs:

$$R_{top_lug} \coloneqq \frac{P_{car_ult} \cdot 18 \cdot in}{4.69 \cdot in}$$

$$R_{top_lug} = 4965.41bf$$

Analysis of the Cargo Arm Top Stanchion Lug:

$$OD := 3.0 \cdot in$$

$$t_{lug} := 1.35 \cdot in$$

$$\mathsf{A}_{\mathtt{cs_lug}} \coloneqq (\mathtt{OD} - \mathtt{ID}) \cdot \mathsf{t}_{\mathtt{lug}} \qquad \mathsf{Cross Sectional Area of Lug}$$

$$A_{cs_lug} = 1.01 \text{ in}^2$$

Stress:

$$\sigma_{top_lug} = \frac{R_{top_lug}}{A_{cs_lug}}$$

$$\sigma_{top_lug} = 4.9 \, \text{ksi}$$

Margin of Safety:

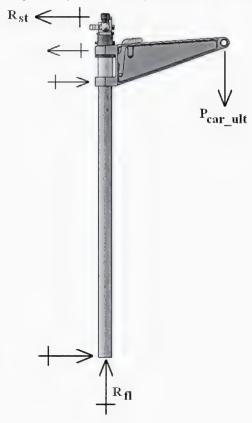
$$MS = \frac{F_{tu_6061}}{\sigma_{top_lug}} - 1$$

$$MS = 7.6$$

MARGIN OF SAFETY IS POSITIVE



The vertical load on the Cargo Arm places a compression and a bending moment on the stanchion.



GEOMETRY:

Refer to AERO Design drawings 79201 for further information.

Beam Structure of Arm:	Length of Cargo Arm from the root to the lug at the tip.	$L_{\text{sum}} := 18.00 \cdot \text{in}$
	Height of arm	$h_{snn} := 6.75 \cdot in$
Stanchion:	Diameter of stanchion.	$D_{stn} := 2.00 \cdot in$
	Thickness of stanchion tube wall.	$t_{stn} := 0.12 \cdot in$
$d_{stn} \coloneqq D_{stn} - 2 \cdot t_{stn}$	Inside Diameter of stanchion.	$d_{stn} = 1.76 in$
(h _{err})	Total length of stanchion tube from floor to ceiling.	$L_{st} := 50.7 \cdot in$
$\mathbf{a} := \left(46.6 \cdot \mathbf{in} - \frac{\mathbf{h}_{mm}}{2}\right)$	Distance from center of lugs down to floor.	a = 43.23 in

LOADS:

$P_{\mathbf{z}} \coloneqq W_{\text{cargo}} \cdot n_{\mathbf{z}} \cdot n_{\mathbf{sf}} \cdot n_{\mathbf{f}}$	Ultimate Vertical Load applied to lug at end of Cargo ar	m. $P_z = 12941bf$
$M_{ann} := P_{\mathbf{z}} \cdot L_{ann}$	Bending Moment at root of Cargo arm due to vertical lo	ad. M _{smm} = 23287 lbf·in
	Ultimate Vertical Load applied to lug at end of Cargo Arm.	P _{cer_ult} = 12941bf
	Distance between Cargo Arm lug and center of stanchion.	$L_{2000} = 18.00 \text{ in}$
$M_{\text{st}} \coloneqq P_{\text{car_ult}} \cdot L_{\text{amm}}$	Bending Moment applied to stanchion by vertical load.	$M_{st} = 23287 lbf \cdot in$
	Total length of stanchion tube from floor to ceiling.	$L_{st} = 50.70 \text{in}$
	Distance from center of sleeve down to the floor.	a = 43.23 in
$\mathfrak{b} := \mathbf{L}_{st} - \mathbf{a}$	Distance from center of sleeve up to the ceiling.	b = 7.47 in
	Outside Diameter of the stanchion.	$D_{stn} = 2.00 in$
	Inside Diameter of the stanchion.	$d_{sin} = 1.76 in$
$I_{st} = \frac{\pi}{64} \cdot \left(D_{stn}^{4} - d_{stn}^{4} \right)$	Moment of Inertia of the stanchion tube.	$I_{st} = 0.31 \text{ in}^4$
$\mathbf{M}_{\text{no_comp}} \coloneqq \frac{\mathbf{a}}{\mathbf{L}_{\text{st}}} \cdot \mathbf{M}_{\text{st}}$	Maximum Bending Moment in the stanchion if the compression component of the applied load were to be ignored.	$M_{\text{no_comp}} = 198541bf \cdot in$

Bruhn, Equation A5.9 breaks down the bending moment equations into terms that are looked up on Table A5.1, Case VIII. Bending moments on each side of the applied couple are defined differently.

$$j := \sqrt{\frac{E_{2024} \cdot I_{st}}{P_{csr_ult}}}$$

Axial Load Factor (Ref. Bruhn, Page A5.21).

$$j = 51 in$$

$$C_{1a} \coloneqq (-1) \cdot M_{st} \cdot \frac{\cos\left(\frac{b}{j}\right)}{\sin\left(\frac{L_{st}}{j}\right)}$$

First term of Eq. A5.9, where x<a.

 $C_{1a} = -27480 \, lbf \cdot in$

 $C_{2a} := 0 \cdot lbf \cdot in$

$$M_a(x) := C_{1a} \cdot \sin\left(\frac{x}{i}\right) + C_{2a} \cdot \cos\left(\frac{x}{i}\right)$$

Equation A5.9 with terms C1 and C2 substituted. The term f(w) is ignored because no uniform load is applied.

Bending Moment in stanchion solved just below attachment of Cargo Arm.

 $M_a(a) = -20603 \, lbf \cdot in$

$$C_{1b} := (-1) \cdot M_{st} \cdot \frac{\cos\left(\frac{a}{j}\right)}{\tan\left(\frac{L_{st}}{j}\right)}$$

First term of Eq. A5.9, where x>a.

 $C_{1b} = -10020 \, \text{lbf} \cdot \text{in}$

$$C_{2b} \coloneqq M_{st} \cdot cos \left(\frac{a}{j}\right)$$

Second term of Eq. A5.9, where x>a.

 $C_{2b} = 15410 \, lbf \cdot in$

$$M_b(x) := C_{1b} \cdot \sin\left(\frac{x}{j}\right) + C_{2b} \cdot \cos\left(\frac{x}{j}\right)$$

Equation A5.9 with terms C1 and C2 substituted. The term f(w) is ignored because no uniform load is applied.

Bending Moment in stanchion solved just above attachment of Cargo Arm.

 $M_b(a) = 26851bf \cdot in$

$$M_{max} := |M_a(a)|$$

Maximum Bending Stress occurs at "a", where Cargo Arm attaches to stanchion.

 $M_{max} = 20603 \, lbf \cdot in$

$$f_{b_st} := \frac{M_{max} \cdot \left(\frac{D_{stn}}{2}\right)}{I_{st}}$$

Bending Stress in stanchion due to Cargo Arm Loads.

 $f_{b_st} = 65.5 \, \text{ksi}$

Ultimate Tensile Strength of 2024-T3 tube (Mil-Hdbk-5H).

 $F_{tu_2024}=64\,\mathrm{ksi}$

D/t ratio for stanchion tube.

 $\frac{D_{stn}}{t_{stn}} = 17$

Ultimate Bending Modulus of 2024-T3 stanchion tube (Ref. Mil-Hdbk-5H, Figure 3.11.1.1.1).

 $F_b := 66.6 \cdot ksi$

$$\text{MS} := \frac{F_b}{f_{b_st}} - 1$$

Ultimate Bending Margin of Safety of stanchion.

MS=0.02

Bending moment applied by cargo arm to stanchion is reacted at the floor and ceiling attachments.

$R_{st} \coloneqq \frac{M_{st}}{L_{st}}$	Lateral Reaction Loads at top and bottom of stanchion are equal.	$R_{st} = 459 lbf$
	Lateral and Longitudinal load allowable for ceiling hard- point (Ref. Bell Helicopter Report 205-099-205).	$P_{lat} := 1250 \cdot 1bf$
$\frac{MS}{N} := \frac{P_{lat}}{R_{ct}} - 1$	Margin of Safety of stanchion attachment to ceiling hard-point for lateral reaction loads.	MS = 1.72

Vertical load applied by cargo arm to stanchion is reacted at the floor attachment hardpoint.

$R_{fl} := P_{car_ult}$	Vertical Reaction Load at bottom of stanchion.	$R_{fl} = 12941bf$
	Vertical load allowable for floor hard-point (Ref. Bell Helicopter Report 205-099-205).	P _{ver} := 2150·16f
$MS = \frac{P_{ver}}{P_{e}} - 1$	Margin of Safety of stanchion attachment to floor hard-point for vertical load.	MS = 0.66

MARGIN OF SAFETY IS POSITIVE

6.3 Structural Test

A structural test was conducted to simulate a limit and ultimate load onto the Cargo Deployment Arm and Stanchion Tube. This test was conducted to support the structural analysis findings of this document.

The test set-up applied loads at vertical and used the same aircraft roof fitting hardware to mount the tube assembly (see Figure 6.3.1 and Figure 6.3.2).

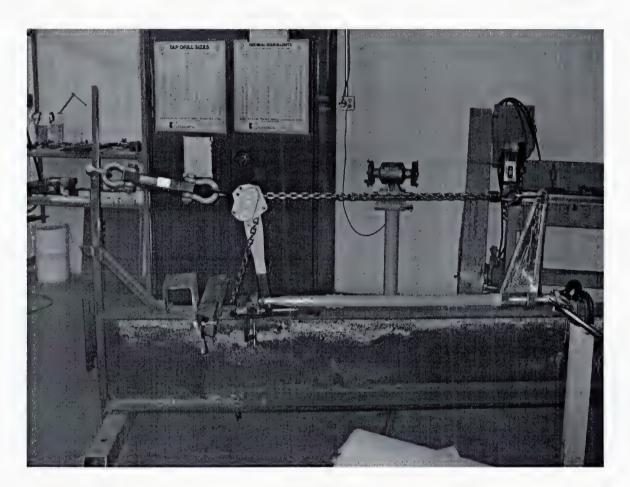


Figure 6.3.1

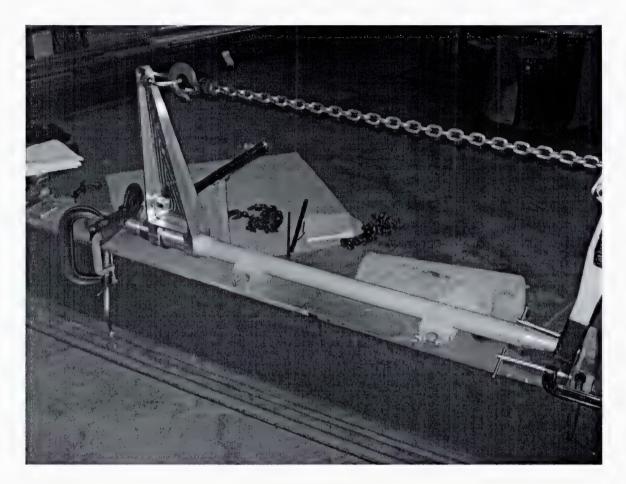


Figure 6.3.2

The test loaded the tube assembly to above limit load (See Figure 6.3.3):

Limit load (250lbf x 3)= 750 lbf Test Limit Load = 790 lbf

The assembly showed no signs of permanent deformation.

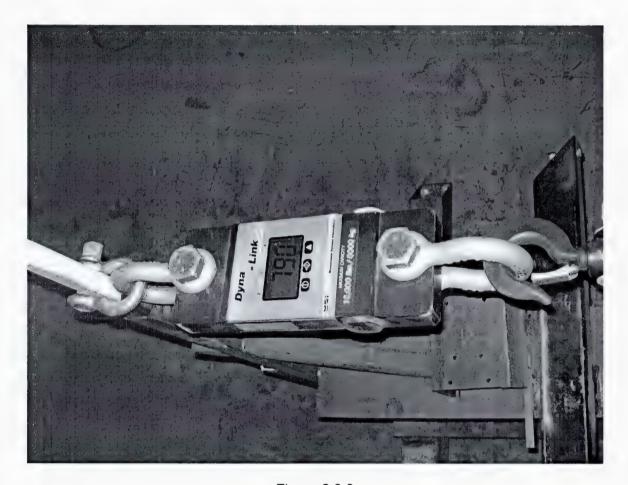


Figure 6.3.3

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The test loaded the tube assembly to above ultimate load (See Figure 6.3.4):

Ultimate load (250lbf x 3 x 1.5)= 1125 lbf Test Ultimate Load = 1140 lbf

The tube assembly showed no signs of permanent deformation.



Figure 6.3.4

Results: This test supports the engineering finding in this report.

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7.0 STRUCTURAL ANALYSIS - RAPPEL STEP

7.1 Loads and Factors

There are two categories of load that can be applied to this step:

- 1) Aerodynamic Loads
- 2) Personnel Loads

There are no loads for this step specified by airworthiness regulations.

Aerodynamic Drag Load:

The forward mounting plate at stn 84.46 is the critical component for this analysis. This plate has the greatest frontal area and greatest distance between supports.

Drag Coefficent (plate) per Hoerner

$$C_d := 1.95$$

Air Density

$$\rho := 0.002376898 \cdot \frac{\text{slug}}{n^3}$$

Aircraft "Never Exceed" Velocity

$$v_{ne} := 219.4 \cdot \frac{ft}{sec}$$

Aircraft "Design" Velocity

$$v_d := \frac{v_{ne}}{0.9}$$

Frontal Area of Mounting Plate 79821-01

$$A_{plate_stn84} := 65.4 \cdot in^2$$

Force Applied to Mounting Plate 79821-01 as a result of aerodynamic drag at Vd.

$$F_d := 0.5 \cdot \rho \cdot v_d^2 \cdot A_{plate stn84} \cdot C_d$$

$$F_{cl} = 62.51bf$$

This force is then applied to the mounting plate for beam bending analysis

Reaction At "A"

$$R_{A}:=\frac{F_{d}\cdot7.6\cdot in}{20.77\cdot in}$$

 $R_A = 22.91bf$

Reaction At "C"

$$R_{C} := \frac{F_{d} \cdot 13.17 \cdot \text{in}}{20.77 \cdot \text{in}}$$

 $R_{\rm C} = 39.71 {\rm bf}$

Max Bend Moment at "B"

$$\mathbf{M_B} \coloneqq \mathbf{R_A} \cdot \mathbf{13.17} \cdot \mathbf{in}$$

 $M_B = 301.4$ in lbf

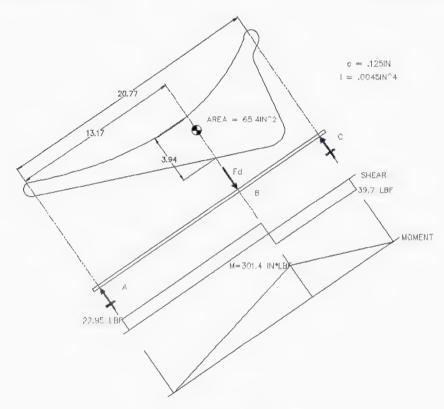


Figure 7.1.1

Section Properties at "B":

Centroid $c_{\mathrm{B}} \coloneqq 0.125 \cdot \mathrm{in}$

Moment of Inertia $I_D := 0.0045 \cdot in^4$

Stress:

$$\sigma_{\text{MB}} := \frac{M_{\text{B}} \cdot c_{\text{B}}}{I_{\text{D}}} \qquad \qquad \sigma_{\text{MB}} = 8373 \, \text{psi}$$

Mechanical Properties 6061-T $F_{tu_6061} := 30 \cdot ksi$

Margin of Safety:

$$MS_{MB} := \frac{F_{tu}_{6061}}{\sigma_{MB}} - 1$$
 $MS_{MB} = 2.6$

MARGIN OF SAFETY IS POSITIVE

Operational Loads

The Rappel Step is used in flight as a stabilizing structure for which suspended rappellers exiting the helicopter can steady and prepare themselves for the rappel. This operational mode is not likely to induce much load onto the Rappel Step since the rappeller is primarily supported by the rappel rope.

A more critical operational load case for the rappel step would be persons using the Rappel Step for entering or exiting the helicopter while on the ground. The following analysis shall determine that the step can support two (2) 95th percentile males, standing shoulder to shoulder, at 2Gs. The analysis will assume the load is normal to the stepping surface of the step.

The 2G load factor conservatively accounts for dynamic forces the persons induces by exiting or entering the helicopter.

Anthopometric Data - 95th Percentile Male

Weight $W_{95_M} := 216.3 \cdot 10f$

Shoulder Breadth (Ground Forces) $D_{sh_95_M} := 19.6 \cdot in$

Load factor for analysis $n_{\mbox{lf_step}} := 2$

Load per Person on step

$$P_{step} := W_{95_M} \cdot n_{lf_step}$$
 $P_{step} = 432.61bf$

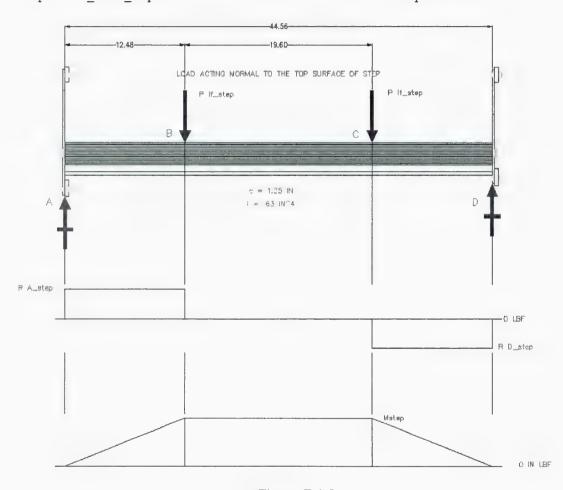


Figure 7.1.2

Reactions

$$R_{D_step} := \frac{P_{step} \cdot 12.48 \cdot in + P_{step} \cdot (D_{sh_95_M} + 12.48 \cdot in)}{44.56 \cdot in}$$

$$R_{D_step} = 432.61bf$$

$$R_{A_step} := \frac{P_{step} \cdot 12.48 \cdot in + P_{step} \cdot (D_{sh_95_M} + 12.48 \cdot in)}{44.56 \cdot in}$$

$$R_{A_step} = 432.61 \text{ lbf}$$

Bending Moment

Mechanical Properties of the Step Extrusion

Centroid
$$c_{step} := 1.25 \cdot in$$

Moment of Inertia
$$I_{step} := 0.63 \cdot in^4$$

Stress

$$\sigma_{\text{step}} \coloneqq \frac{\text{MB_step} \cdot c_{\text{step}}}{I_{\text{step}}} \qquad \qquad \sigma_{\text{step}} = 10712 \, \text{psi}$$

Margin of Safety:

$$MS_{step} := \frac{F_{tu} \underline{6061}}{\sigma_{step}} - 1 \qquad \qquad MS_{step} = 1.8$$

MARGIN OF SAFETY IS POSITIVE

Shear Load on the AN4 bolts holding the step onto the plate is the same on both sides of the step. This analysis is also applied to the AN4 bolts attaching the plates to the helicopter hardpoints.

Mechanical Properties of AN4 Bolt (single shear) $F_{su_AN4} = 3680 \cdot lbf$

Margin of Safety:

$$MS_{step_AN4} := \frac{F_{su_AN4}^{2}}{R_{A_step}} - 1$$

$$MS_{step_AN4} = 16$$

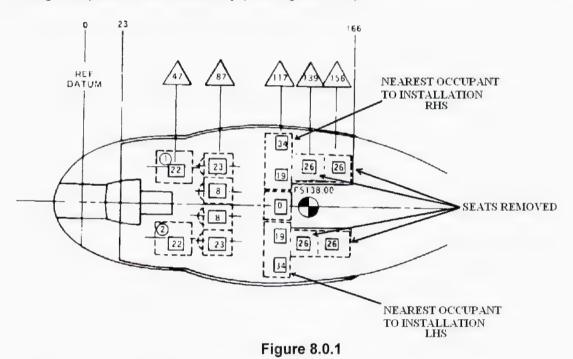
MARGIN OF SAFETY IS POSITIVE

7.2 Rappel Step Compliance with FAR 29.251, Vibration

The Rappel Step Installation has been found to be in compliance with FAR 29.251. Refer to AERO Design Ltd. Flight Test Plan/Report TP757.02 for details.

8.0 COMPLIANCE WITH 29.785(A), SEATS, BIRTHS, LITTERS, SAFETY BELTS, AND HARNESSES.

The installation of the Rappel Mount Provision and Cargo Deployment Arm has been evaluated for proximity to the helicopter occupant extremity strike envelope. This section evaluated the extremity strike envelope of the outboard-most occupants on the forward facing, five-position seat assembly (See Figure 8.0.1).



AC29-2C Para (AC29.785)(2)(ii) states:

- (2) The following criteria have been found satisfactory for preventing occupant head injuries:
- (ii) Elimination of injurious objects within striking distance of the head and other vital parts can be accomplished by removal of objects with sharp edges or rigid surfaces from within striking distance of vital parts of the occupant. Dimensions and weights for typical occupants are available in U.S. Army USAAULABS Reports 70-22 (August 1969) and 66-39 (June 1966) and NACA Report TN 2991 (August 1953). Because of the range of occupant head striking distance, a combination of "elimination of injurious objects" and "cushioned rests" may be required for some interior configurations.

The position of this document is that the installation of the Rappel Mount Provision and Cargo Deployment Arm do not add injurious objects within the strike envelope of the nearest occupant to the installation.

Figures 8.0.2 and 8.0.3 show a ninety-fifth percentile male occupant's extremity strike envelopes restrained with the lap belt only. These strike envelopes are based on U.S. Army USAAVLABS TR 70-22.

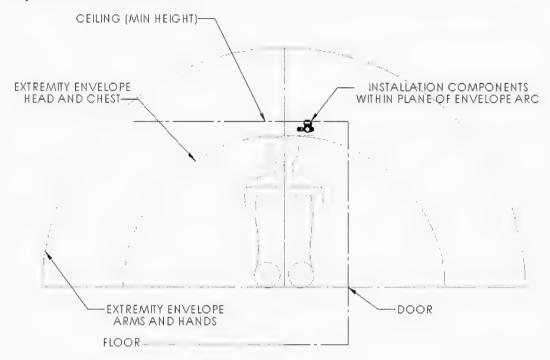


Figure 8.0.2

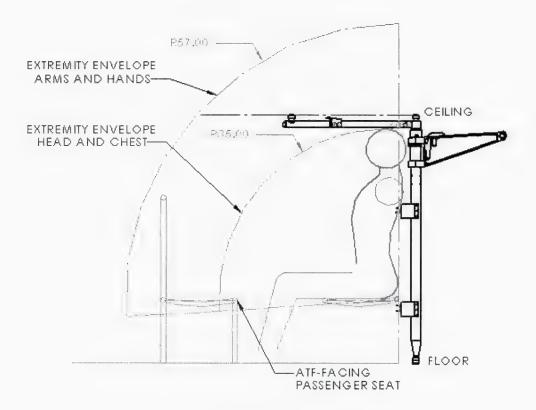


Figure 8.0.3

8.1 Primary Hazards:

The components of the Rappel Mount Provision and Cargo Deployment Arm Installation are outside of the seated and retrained occupant's head and chest strike envelope.

8.2 Secondary Hazards:

Compromising the occupant's ability to effect a rapid escape from the aircraft due trapping or injuring the lower extremities by this installation has been considered. The lower extremities of the occupant are not in the proximity of this installation and therefore unlikely to be injured or trapped by this installation.

8.3 Tertiary Hazards:

This installation is within the upper limb strike envelope of the nearest occupant. The rounded features of all of the installations components eliminate the likelihood of a piercing injury. The occupant may sustain a blunt force upper limb injury by striking the installation in the occurrence of an emergency landing.

This injury occurrence potential is similar to the injury occurrence potential of the same occupant striking the aft facing passenger seat structure of the type certified design of the aircraft. In the case of a forward emergency landing condition, the aft facing seat structure is within the upper limb strike envelope of the occupant. The injury occurrence potential of the occupant striking the seat assembly and the rappel mount provision is similar in that the struck object is a rounded tube or fitting.

It should be noted that the aft facing seat assembly is also within the occupant's head and chest strike envelope. Furthermore, the off-set seating arrangement between the aft-facing and forward-facing seats exposes the forward facing occupants to the vertical structure members of the aft-facing seats.

By comparison, the installation of the Rappel Mount Provision and Cargo Deployment Arm provide no less tertiary hazards than the type certified design of the aircraft.

8.4 Upper Torso Vulnerability:

The components of the Rappel Mount Provision and Cargo Deployment Arm Installation are behind the left shoulder of the seated and retrained occupant. The strike envelope for upper torso movement has been considered and does not interface this installation.

9.0 COMPLIANCE WITH 29.785(E), SEATS, BIRTHS, LITTERS, SAFETY BELTS, AND HARNESSES.

The Rappel Mount Provision and Cargo Deployment Arm Installation position is at the outboard-most edge of the passenger seats and within close proximity to the crew door. Passengers moving about the cabin would not likely be within the proximity of this installation during normal flight.

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APPENDIX A - AIRCRAFT AIRWORTHINESS DIRECTIVES

Directives Pertaining to Aircraft Model: BELL TEXTRON - USA, 212

New Prod Ctry	AD Number	AD Subject Service B Refer	
A CF	CF-98-15	EXTERNAL RESCUE SYSTEMS CAR 702.21	NO
A CF	<u>CF-97-04</u>	FUEL LINE - CHANGE TO 212-96-157 STAINLESS ELBOW FITTING	NO
A CF	CF-96-06	EMERGENCY ESCAPE PANELS	YES
A CF	<u>CF-95-20R1</u>	BOLTS OF FLIGHT CONTROL 212-67-01 SERVO ACTUATORS	NO
A CF	<u>CF-94-07</u>	ZINC PRIMER AS OVERHEAT 212-93-89 F INDICATOR	REV A REFER TO AD
A CF	<u>CF-91-29R1</u>	AFT FACING SEAT HEADRESTS	REFER TO AD
A CF	<u>CF-91-27</u>	EMERGENCY ESCAPE RELEASE HANDLE COVERS	REFER TO AD
A CF	CF-90-16R3	MAIN ROTOR YOKE 212-90-60 F	REV A REFER TO AD
A CF	<u>CF-88-23R1</u>	BLADE STRAP PINS A8-27-45	REFER TO AD
A EU	2006-0241	Replacement of Main Case P/N BC85-051 and piston BC85-052 with improved units made of stainless steel 6S80D. CALEDONIA AIRBORNE SYSTEMS 6 600/900/SB	TO AD SB CPT-
A US	2007-22-02	Tail rotor blade (blade) forward tip 212-00-111 weight retention block (tip block) and the aft tip closure (tip closure)	REFER TO AD
A US	2007-19-53	Missing Adhesive to the tip weight ASB 212-07 greens.	'-125 NO
A US	2005-20-38	To prevent rupture of an adapter, AA-05005, I uncontrolled jetting of pressurized A gas from the nitrogen bottle	REVISION REFER TO AD
A US	2003-01-04	204B, 205A /A-1/B, 212 - ASB 212-94 INSPECT MAIN ROTOR HUB A	-92 REV REFER TO AD
A US	2002-22-14	204B, 205A/B, 212, 214B/B1 - MAIN ROTOR TT STRAPS	REFER TO AD

Α	US <u>2002-19-05</u>		212 MODELS - VIRTICAL FIN FORWARD SPAR CAP	ASB 212-00-110 REV A	REFER TO AD
Α	US <u>2001-13-01</u>	D	TAIL ROTOR COUNTERWEIGHT BELLCRANK RETENTION NUT	ASB 212-00-107RA	REFER TO AD
Α	US <u>2001-08-04</u>	D	MAIN ROTOR ACTUATOR LOCKING WASHER	ASB 41105950-67A- 01	REFER TO AD
Α	US <u>2000-15-52</u>		MAIN ROTOR MAST/TRUNNION		REFER TO AD
Α	US <u>98-11-15</u>		TAIL ROTOR YOKE ASSY FAILURE.	ASB 212-96-100/101	REFER TO AD
Α	US <u>94-18-09</u>	D	MAIN TRANSMISSION LOWER PLANETARY SPIDER	212-93-83	REFER TO AD
Α	US <u>93-17-12</u>	D	MAIN ROTOR TRANSMISSION LOWER PLANETARY SPIDER	SUPERCEDES 92-11- 07	REFER TO AD
Α	US <u>93-05-01</u>	D	POSSIBLE MAIN ROTOR YOKE FATIGUE FAILURE		REFER TO AD
Α	US <u>92-23-01</u>	٥	PREVENT SEPERATION MAIN ROTOR PILLOW BLOCKS	212-90-62 REV A	REFER TO AD
Α	US <u>92-13-10</u>	D	TAIL ROTOR DRIVESHAFT HANGER BEARINGS	SUPERCEDES 91-24- 16	REFER TO AD
Α	US <u>92-09-05</u>	D	ENG DRIVESHAFT COUPLING ADAPTER	212-91-67	REFER TO AD
Α	US <u>92-07-08</u>	D	SWASHPLATE SUPPORT ASSEMBLY	212-91-72	REFER TO AD
Α	US <u>90-26-11</u>	D	MAIN ROTOR DRAG BRACE ASSEMBLY	212-90-59	REFER TO AD
Α	US <u>90-03-09</u>	D	T / R TRUNNION BEARING HOUSING ASSEMBLY	212-86-39 REV A	REFER TO AD
Α	US <u>89-08-05</u>	n	MAIN TRANSMISSION - SPIRAL BEVEL GEARS		REFER TO AD
Α	US <u>86-17-09</u>	D	TAIL ROTOR TRUNNION BEARING HOUSING	212-86-39RA	REFER TO AD
Α	US <u>81-19-01</u>	n	MAIN ROTOR YOKE	ASB 212-81-23	REFER TO AD
Α	US <u>81-10-07</u>		SWASHPLATE SUPPORT	ASB 212-81-22	REFER

		D		TO AD
А	US <u>80-21-05</u>	D	LANDING GEAR CROSS TUBES	REFER TO AD
Α	US <u>79-20-05</u>		MAIN ROTOR HUB ASSEMBLY	REFER TO AD
Α	US <u>79-05-08</u>	ח	EMER FLOTATION (DITCHING) EQUIPMENT	REFER TO AD
Α	US <u>78-21-02</u>	D	EXTERNAL LOAD LINK ASSEMBLY	REFER TO AD
А	US <u>78-20-07</u>	D	SHOULDER RADIUS FITTING	REFER TO AD
Α	US <u>78-17-03</u>	n	SPIRAL BEVEL GEAR	REFER TO AD
Α	US <u>78-14-07</u>	D	SKID LANDING GEAR	REFER TO AD
Α	US <u>78-09-02</u>	D	EMERGENCY FLOAT KITS	REFER TO AD
Α	US <u>77-17-05</u>	D	EMERGENCY EXIT LATCH PIN	REFER TO AD
Α	US <u>77-17-03</u>	n	TAIL ROTOR BLADE PITCH HORN	REFER TO AD
Α	US <u>77-10-05</u>	D	CRACKS IN MAIN ROTOR BLADES SKIN	REFER TO AD
Α	US <u>77-05-02</u>	Π	MAIN ROTOR BLADES	REFER TO AD
Α	US <u>76-14-03</u>	D	CROSS TUBE ASSEMBLIES	REFER TO AD
Α	US <u>76-02-06</u>	D	MAIN ROTOR BLADES	REFER TO AD
Α	US <u>75-26-05</u>		MAIN ROTOR BLADES	REFER TO AD
Α	US <u>75-26-03</u>	D	EMERGENCY EXIT HANDLE	REFER TO AD
Α	US <u>75-07-01</u>	D	HIGH FREQUENCY VIBRATION	REFER TO AD

Α	US <u>74-20-05</u>	D	ELEVATOR MODIFICATION	REFER TO AD
Α	US <u>74-02-01</u>	n	TAIL ROTOR TRUNNION BEARINGS	REFER TO AD

Directives Pertaining to Aircraft Model: BELL TEXTRON - USA, 205A 1

New Type Ctr	Y.	AD Number		AD Subject	Service Bulletin or Reference	Repeat Insp.?
A C	F <u>(</u>	CF-98-15		EXTERNAL RESCUE SYSTEMS	CAR 702.21	NO
A C	F <u>(</u>	CF-96-06	D	EMERGENCY ESCAPE PANELS		YES
A C	F (CF-95-20R1		BOLTS OF FLIGHT CONTROL SERVO ACTUATORS	205-67-01	NO
A C	F <u>(</u>	CF-94-07		ZINC PRIMER AS OVERHEAT INDICATOR	205-93-58 REV A	REFER TO AD
A C	F <u>(</u>	CF-91-29R1	D	AFT FACING SEAT HEADRESTS		REFER TO AD
A C	F (CF-91-27		EMERGENCY ESCAPE RELEASE HANDLE COVERS		REFER TO AD
A C	FΩ	CF-90-16R3	ם	MAIN ROTOR YOKE	205-90-36 REV A	REFER TO AD
A CI	F <u>(</u>	CF-88-23R1	ם	BLADE STRAP PINS	A8-27-45	REFER TO AD
A C	F <u>(</u>	CF-77-03	口包	205A - ALIGNMENT BETWEEN ENGINE AND TRANSMISSION	205769	YES
A U	S 2	2007-22-02		Tail rotor blade (blade) forward tip weight retention block (tip block) and the aft tip closure (tip closure)	205-00-80	REFER TO AD
A U	S 2	<u>2007-19-53</u>	口团	Missing Adhesive to the tip weight screws.	ASB 205-07-95	NO
A U	S	2003-01-04		204B, 205A /A-1/B, 212 - INSPECT MAIN ROTOR HUB	ASB 212-94-92 REV A	REFER TO AD

Α	US <u>2002-22-14</u>	07	204B, 205A/B, 212, 214B/B1 - MAIN ROTOR TT STRAPS		REFER TO AD
Α	US <u>2002-09-51</u>	n	TAIL ROTOR GRIPS		REFER TO AD
Α	US <u>2001-13-01</u>		TAIL ROTOR COUNTERWEIGHT BELLCRANK RETENTION NUT	ASB 205-00-77RA	REFER TO AD
Α	US <u>2001-08-04</u>	n	MAIN ROTOR ACTUATOR LOCKING WASHER	ASB 4 1105950- 67A-01	REFER TO AD
Α	US <u>2000-15-52</u>		MAIN ROTOR MAST/TRUNNION		REFER TO AD
Α	US <u>99-18-02</u>	n	VERTICAL FIN SPAR CAP	ASB 205-98-70	REFER TO AD
Α	US <u>99-17-03</u>		FAILURE OF TAILBOOM VERTICAL FIN SPAR	ASB 205-98-71 REV A	REFER TO AD
Α	US <u>98-11-14</u>	ח	TAIL ROTOR YOKE ASSY FAILURE	ASB205-96-68/69	REFER TO AD
Α	US <u>94-18-09</u>		MAIN TRANSMISSION LOWER PLANETARY SPIDER	205-93-54	REFER TO AD
Α	US <u>93-17-12</u>	Γ	MAIN ROTOR TRANSMISSION LOWER PLANETARY SPIDER	SUPERCEDES 92- 11-07	REFER TO AD
Α	US <u>92-27-21</u>		TAIL ROTOR DRIVE SHAFT	205-92-49	REFER TO AD
Α	US <u>92-23-01</u>		PREVENT SEPERATION MAIN ROTOR PILLOW BLOCKS	205-90-38 REV A	REFER TO AD
Α	US <u>92-13-10</u>		TAIL ROTOR DRIVESHAFT HANGER BEARINGS	SUPERCEDES 91- 24-16	REFER TO AD
Α	US <u>92-07-08</u>		SWASHPLATE SUPPORT ASSEMBLY	205-91-45	REFER TO AD
Α	US <u>86-17-10</u>		TAIL ROTOR TRUNNION BEARING HOUSING	205-86-24RA	REFER TO AD
Α	US <u>81-19-02</u>	n	MAIN ROTOR YOKE	ASB 204-81-11	REFER TO AD
Α	US <u>80-21-05</u>		LANDING GEAR CROSS TUBES		REFER TO AD
Α	US <u>79-20-05</u>	П	MAIN ROTOR HUB ASSEMBLY		REFER TO AD

Α	US	<u>78-21-02</u>		EXTERNAL LOAD LINK ASSEMBLY	REFER TO AD
Α	US :	78-20-07	D	SHOULDER RADIUS FITTING	REFER TO AD
Α	US	78-14-07	0	SKID LANDING GEAR	REFER TO AD
Α	US :	77-17-05	D	EMERGENCY EXIT LATCH PIN	REFER TO AD
Α	US :	77-17-03	0	TAIL ROTOR BLADE PITCH HORN	REFER TO AD
Α	US]	77-10-07	D	ENGINE-TO-TRANSMISSION ASSY	REFER TO AD
Α	US :	<u>76-14-03</u>		CROSS TUBE ASSEMBLIES	REFER TO AD
Α	US :	76-12-07		TAIL ROTOR CHAINS	YES
Α	US]	<u>76-10-01</u>		TAIL BOOM	REFER TO AD
Α	US]	76-06-02	D	FIRE EXTINGUISHER CIRCUIT	REFER TO AD
Α	US]	76-02-06		MAIN ROTOR BLADES	REFER TO AD
Α	US]	<u>75-26-05</u>		MAIN ROTOR BLADES	REFER TO AD
Α	US]	75-26-03	ח	EMERGENCY EXIT HANDLE	REFER TO AD
Α	US]	74-23-02	n	TAIL ROTOR PITCH	REFER TO AD
Α	US]	74-02-01	n	TAIL ROTOR TRUNNION BEARINGS	REFER TO AD
Α	US]	73-17-04	D	TAIL ROTOR GRIPS	REFER TO AD
Α	US]	73-16-03	n	LANDING GEAR CROSS TUBES	REFER TO AD
Α	US :	71-21-02		TAIL FIN AND BOOM	REFER

				TO AD
Α	US <u>70-06-02</u>	ם	TAIL ROTOR GRIP ASSY	REFER TO AD
Α	US <u>69-15-07</u>		FLOAT KIT TUBE	REFER TO AD

All airworthiness directives applicable to:

Manufacturer: BELL TEXTRON - USA

Model: 205B

AD Record List

New Model	Ctry. AD Number	AD Subject Service Bulletin or Reference	Repeat Insp.?
205B	CF <u>CF-88-</u> 23R1	BLADE STRAP PINS A8-27-45	REFER TO AD
205B	CF <u>CF-98-15</u>	EXTERNAL RESCUE SYSTEMS CAR 702.21	NO
205B	US <u>2007-22-02</u>	Tail rotor blade (blade) forward tip 205B-00-34 weight retention block (tip block) and the aft tip closure (tip closure)	REFER TO AD
205B	US <u>2007-19-53</u>	Missing Adhesive to the tip weight ASB 205B-07-46 ☐ Screws.	NO
205B	US <u>2003-01-04</u>	204B, 205A /A-1/B, 212 - INSPECT ASB 212-94-92 REV A MAIN ROTOR HUB	REFER TO AD
205B	US <u>2002-22-14</u>	204B, 205A/B, 212, 214B/B1 - ☐ MAIN ROTOR TT STRAPS	REFER TO AD
205B	US <u>2002-09-51</u>	TAIL ROTOR GRIPS	REFER TO AD
205B	US <u>2001-13-01</u>	TAIL ROTOR COUNTERWEIGHT ASB 205B-00-31RA BELLCRANK RETENTION NUT	REFER TO AD
205B	US <u>2001-08-04</u>	MAIN ROTOR ACTUATOR ASB 41105950-67A-01 LOCKING WASHER	REFER TO AD
205B	US <u>2000-15-52</u>	MAIN ROTOR MAST/TRUNNION	REFER TO AD

205B	US <u>99-18-02</u>		VERTICAL FIN SPAR CAP	ASB 205-98-70	REFER TO AD
205B	US <u>98-11-14</u>	D	TAIL ROTOR YOKE ASSY FAILURE	ASB205-96-68/69	REFER TO AD
205B	US <u>94-18-09</u>		MAIN TRANSMISSION LOWER PLANETARY SPIDER	412-93-72 REV A	REFER TO AD
205B	US <u>93-17-12</u>	D	MAIN ROTOR TRANSMISSION LOWER PLANETARY SPIDER	SUPERCEDES 92-11-07	REFER TO AD
205B	US <u>92-23-01</u>		PREVENT SEPERATION MAIN ROTOR PILLOW BLOCKS	212-90-62 REV A	REFER TO AD
205B	US <u>92-13-10</u>	ח	TAIL ROTOR DRIVESHAFT HANGER BEARINGS	SUPERCEDES 91-24-16	REFER TO AD
205B	US <u>92-27-21</u>	D	TAIL ROTOR DRIVE SHAFT	205-92-49	REFER TO AD
205B	US <u>92-07-08</u>	ם	SWASHPLATE SUPPORT ASSEMBLY	204-91-32	REFER TO AD
205B	US <u>81-19-02</u>	D	MAIN ROTOR YOKE	ASB 205-81-16	REFER TO AD

All airworthiness directives applicable to:

Manufacturer: BELL TEXTRON - CAN

Model: 412

AD Record List

New Mode	Ctry. AD Number	AD Subject	Service Bulletin or Reference	Repeat Insp.?
412	CF <u>CF-94-07</u>	ZINC PRIMER AS OVERHEAT INDICATOR	412-93-79 REV A	REFER TO AD
412	CF <u>CF-95-20R1</u>	BOLTS OF FLIGHT CONTROL SERVO ACTUATORS	212-67-01	NO
412	CF <u>CF-98-15</u>	EXTERNAL RESCUE SYSTEMS	CAR 702.21	NO

ER 758.01

412	US <u>2007-22-02</u>	Tail rotor blade (blade) forward tip 412-00-106, AND weight retention block (tip block) 412CR-00-13, and the aft tip closure (tip closure) REVISION A	REFER TO AD
412	US <u>2007-19-53</u>	Missing Adhesive to the tip weight ASB 412-07-123	NO
412	US <u>2001-22-14</u>	FIRE EXTINGUISHING SYSTEM OAS SB 22-09-97 BOTTLE CARTRIDGES INSTALLED TO WALTER KIDDE FIREX BOTTLES	REFER TO AD
412	US <u>2001-13-01</u>	TAIL ROTOR COUNTERWEIGHT ASB 412-00-102RA BELLCRANK RETENTION NUT	REFER TO AD
412	US <u>2001-09-11</u>	TAIL ROTOR YOKE FATIGUE ASB412-96-89 FAILURE	REFER TO AD
412	US <u>2001-08-04</u>	MAIN ROTOR ACTUATOR ASB 41105950- LOCKING WASHER 67A-01	REFER TO AD
412	US <u>2000-18-09</u>	TAILBOOM ATTACHMENT 412-00-100 UPPER LH CAP ANGLE	REFER TO AD
412	US <u>99-23-23</u>	MAIN ROTOR YOKE 412-98-93	REFER TO AD
412	US <u>97-11-04</u>	MAST AND SPLINE PLATE ASB 412-94-81 REV B	REFER TO AD
412	US <u>97-07-06</u>	SWASHPLATE SUPPORT ASSY ASB 412-92-57/61	REFER TO AD
412	US <u>94-18-09</u>	MAIN TRANSMISSION LOWER 412-93-72 REV A PLANETARY SPIDER	REFER TO AD
412	US <u>93-17-12</u>	MAIN ROTOR TRANSMISSION SUPERCEDES 92- LOWER PLANETARY SPIDER 11-07	REFER TO AD
412	US <u>93-02-07</u>	VERTICAL FIN SPAR 412-92-65	REFER TO AD
412	US <u>92-13-10</u>	TAIL ROTOR DRIVESHAFT SUPERCEDES 91- HANGER BEARINGS 24-16	REFER TO AD
412	US <u>92-09-05</u>	ENG DRIVESHAFT COUPLING 412-91-53 ADAPTER	REFER TO AD
412	US <u>82-26-51R1</u>	YOKE ASSEMBLIES SERVICE ASB 412-82-9 TIME	REFER TO AD
412	US <u>90-03-09</u>	T / R TRUNNION BEARING 412-86-25 REV A HOUSING ASSEMBLY	REFER TO AD
412	US <u>89-08-05</u>	MAIN TRANSMISSION - SPIRAL BEVEL GEARS	REFER TO AD

Revision 0

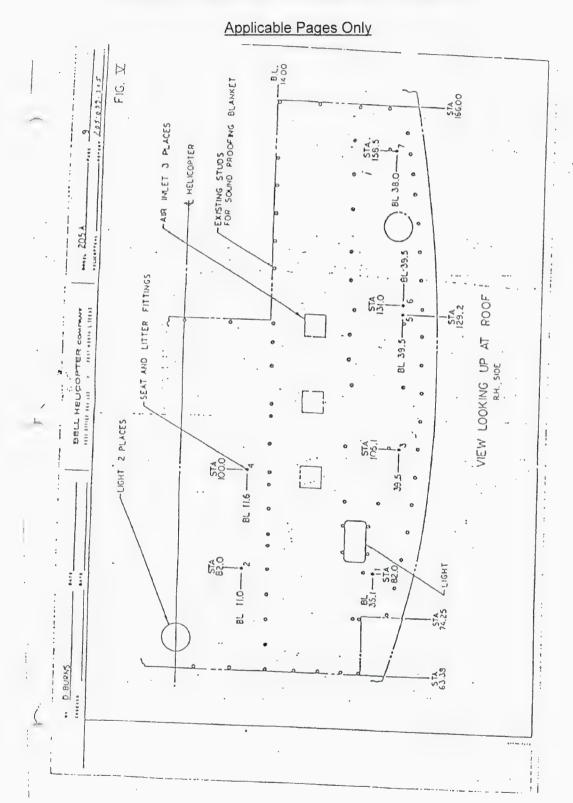
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	AERO Design Ltd.	ER 758.01

412	US <u>86-16-11</u>	D	TAIL ROTOR TRUNNION BEARING HOUSING	4 12-86-25RA	REFER TO AD
412	US <u>85-07-01</u>	ם	MAIN ROTOR PITCH HORN	ASB 412-83-12 REV A	REFER TO AD

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APPENDIX B - BELL HELICOPTERS RPT 205-099-205



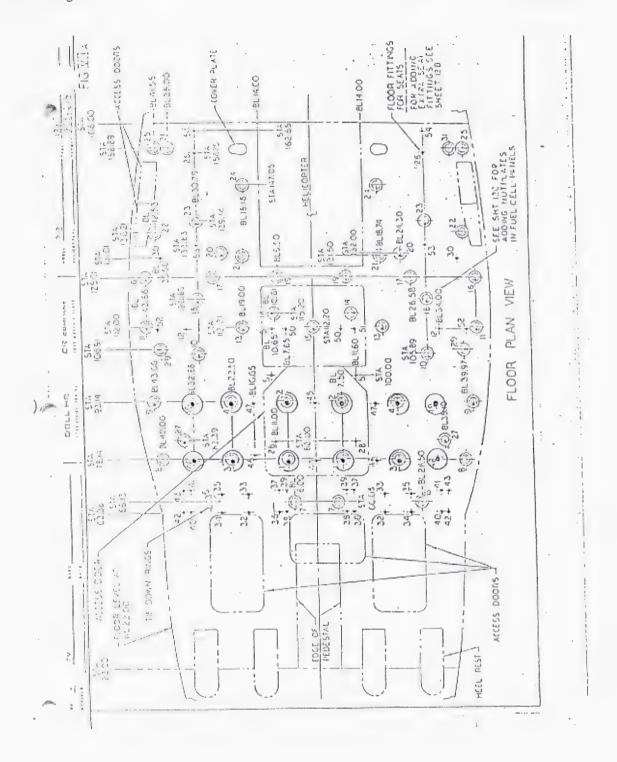
BELL HEUCOPTER COMMANDE 205A 11 212,214 MGE 11 205.099-205

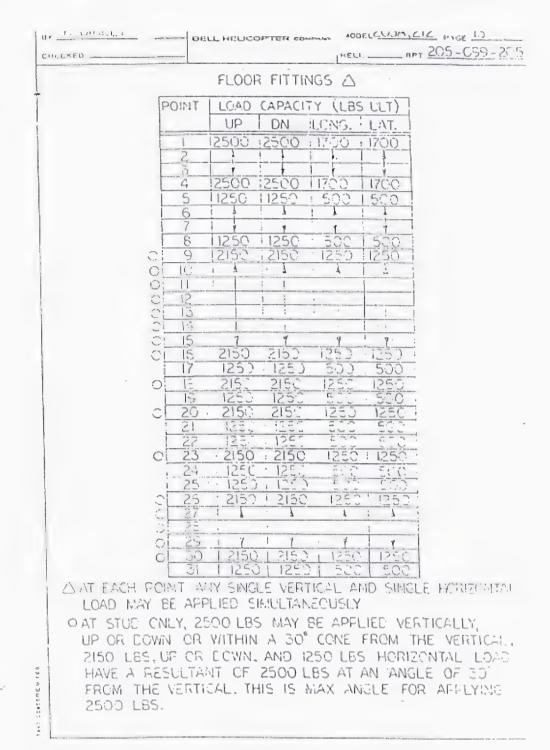
ROOF FITTINGS

POINT	LOAD CAPACITY (LBS ULT)							
	UP							
1		1500	370	1130	*			
2		1500	1250	1250	Δ			
4		1500	1250	10.5.6				
5			1250 1250	1250	Δ			
6			1250	1250	Δ			
7		1500		1230	3			

- * DO NOT COMBINE LONG. AND LAT. LOADS WITH 1500 LB DN LOAD. THE 1130 LB LOAD MAY BE APPLIED IN ANY DIRECTION IN THE LATERAL VERTICAL PLANE.
- APPLY THE LOAD IN ANY DIRECTION IN THE HORIZONTAL PLANE AS LONG AS THE NET LOAD RESULTANT DOES NOT EXCEED 1250 LBS.

AERO Design Ltd. ER 758.01



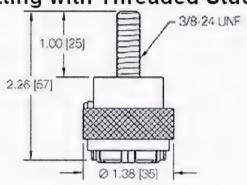


Revision 0

APPENDIX C - 33115 ROOF ATTACHING HARDWARE SPECIFICATIONS

12 Jaw Fitting with Threaded Stud 33115





12 Jaw Fitting with Threaded Stud

0° Vertical Breaking Strength: 5,475 lbs./2485 kgs. 90° Pull Angle Breaking Strength: 2,300 lbs./1045 kgs.

Weight: 0.22 lbs./ 0.10 kgs.

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AERO DESIGN LTD.

FMS758.90

2013 – 39th Avenue NE Calgary, Alberta, T2E 6R7

BELL 212, 412, 205A-1, 205B

ROTORCRAFT FLIGHT MANUAL SUPPLEMENT

for the

INSTALLATION of RAPPEL MOUNT PROVISION

Limited Supplemental Type Certificate No. C-LSH08-157/D

Sections 1, 2, 3 and 4 of this document comprise the Transport Canada Approved sections of this Flight Manual Supplement. Compliance with Section 1, Limitations, is mandatory.

Section 5 and any subsequent sections if present are Unapproved and are provided for information only.

The information and data contained in this Flight Manual Supplement supersede or supplement that contained in the basic Approved Flight Manual for the 212 and 205A-1 when fitted with the Rappel Mount Provision. For limitations, procedures and performance not listed in this Flight Manual Supplement, refer to the Approved Flight Manual and other approved Flight Manual Supplements.

Transport Canada Canada

AIRCRAFT CERTIFICATION DIVISION

APPROVED

By Lucudoul

Approval Date 2008-05-07 YY - MM - DD

Revision 1 07 April 2008

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TRANSPORT CANADA APPROVED

AERO DESIGN LTD.

FMS758.90

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4	Performance	8
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1 LIMITATIONS

1-3 TYPES OF OPERATIONS:

The Rappel Mount Provision is an approved provision for rappel operations only.

Rappel operations permitted during VFR conditions only.

1-4 FLIGHT CREW:

Rappel Operations:

A second crewman is required as a Rappel Operations Load Master if rappel operations are to be conducted. The crewman must have full access of the cabin to perform duties as a Rappel Operations Load Master.

Rappellers may be present as passengers essential to the operation. The Rappellers must have full access of the passenger area within the cabin to perform duties as a Rappel Crew Member.

All Rappel Crew Members are to be directed by the Rappel Operations Load Master.

The Rappel Operations Load Master and all Rappel Crew Members must wear a protective helmet for moving about in the aircraft.

Carriage of Passengers during non-rappel flights:

All passengers must remain seated with the seatbelt fastened during flight.

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1-5 CONFIGURATION:

The aircraft may be equipped with:

A Left Hand Rappel Mount Provision,

A Right Hand Rappel Mount Provision, or

Both Left Hand and Right Hand Rappel Mount Provisions.

1-5-A REQUIRED EQUIPMENT FOR RAPPEL OPERATIONS:

The aircraft must have a functioning communications system betweent the pilot and the load master.

A hook knife must be:

- Carried by the Rappel Operations Load Master for immediate access, or
- Fixed within the helicopter interior, readily accessible to the Rappel Operations Load Master, as detail by the operating agency's operating procedures.

1-7 AIRSPEED

Rappel Operations: Hover with lateral translation at a speed not to exceed 10 knots is permitted for positioning only.

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1-20 MARKINGS AND PLACARDS

Placards 75801-11 and 75801-12 to be in clear view of the pilot

AIRCRAFT MUST BE IN HOVER FOR RAPPEL OPERATIONS

Placard 75801-11

RAPPEL OPERATIONS DURING VFR CONDITIONS ONLY

Placard 75801-12

Placard 75801-13 to be attached to Rappel Mount Provision in clear view of the load master.

MAXIMUM RAPPEL MOUNT CAPACITY 350 LBS (158 KG)

Placard 75801-13

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2 NORMAL PROCEDURES

2-1 INTRODUCTION:

The Rappel Mount Provision is approved for rappel operations only. A rappel operation is the continuous controlled decent of a single person (the rappeller) from the aircraft to the ground. The rappeller descends on a rope fixed to the Rappel Mount Provision and controls the decent.

This section contains instructions for conducting rappel operations.



INTENTIONALLY STOPPING THE DECENT PRIOR TO REACHING THE GROUND IS NOT PERMITTED



USING THE RAPPEL MOUNT PROVISION FOR EXTRACTIONS IS NOT PERMITTED.

2-3 PREFLIGHT CHECK:

Visually inspect the Rappel Mount Provision for loose fasteners and wear.

Ensure the roof and floor fittings are properly in position and locked.

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2-9 IN FLIGHT OPERATIONS - RAPPEL OPERATIONS:

Ensure communication between the pilot and the load master is established and maintained.



STOP RAPPEL OPERATIONS IF COMMUNICATION BETWEEN THE PILOT AND THE LOAD MASTER HAS FAILED

Rappel operations may commence only on the pilot's command

Rappel operations must stop on the pilot's command.

The aircraft must be in hover flight during rappel operations

The aircraft must maintain an altitude that ensures the rappel line is in contact with the ground.

The rappel rope must be dropped to the ground when the rappel operation is complete. Do not retract the rappel line into the aircraft.

The load master must observe the rappel operation and communicate to the pilot the status of the rappel operation continuously.

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3 EMERGENCY PROCEDURES

Suspension line jettisonability lies within the direct control of the load master under the pilots command. Clear communication between the pilot and the load master must be maintained during rappel operations.

SUSPENSION LINE JETTISON PROCEDURE

On the command of the pilot the load master must jettison the suspension line by:

- i. Releasing the suspension line, or
- ii. Cutting the line with the hook knife provided for the Rappel Operations Load Master.



THE SUSPENSION LINE MUST BE CUT AS SHORT AS PRACTICAL.

ANY LOOSE LINE REMAINING MUST BE IMMEDIATELY SECURED TO PREVENT ANY POSSIBLE ENTANGLEMENT WITH THE HELICOPTER ROTOR SYSTEM.

4 PERFORMANCE

No change from basic Rotorcraft Flight Manual.

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5 WEIGHT AND BALANCE

English Units		Long	jitudinal	Lateral		
Item	Weight	Arm	Moment	Arm	Moment	
item	(Lb)	(in)	(in*Lb)	(in)	(in*Lb)	
Left Hand Rappel Mount Provision (If Installed)	7.63	120.4	918.6	-39.5	-301.4	
Right Hand Rappel Mount Provision	7.63	120.4	918.6	39.5	301.4	
(If Installed)						

Metric Units		Long	itudinal	Lateral		
Item	Weight (kg)	Arm (m)	Moment (kg*m)	Arm (m)	Moment (kg*m)	
Left Hand Rappel Mount Provision (If Installed)	3.5	3.06	10.71	-1.00	-3.5	
Right Hand Rappel Mount						
Provision (If Installed)	3.5	3.06	10.71	1.00	3.5	

Note:

A rappeller suspended from the Rappel Mount Provision is located at Fuselage Station 113in and Right Butt Line 50in (for Right Hand Rappel Mount Provision) and/or Left Butt Line -50in (for Left Hand Rappel Mount Provision).

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Page 9 of 9 UNAPPROVED SECTION





Department of Transport

Limited Supplemental Type Certificate

This approval is issued to: Sumber: C-LSH08-157/D

AERO Design Ltd. Issue No.: 1

2013 39th Avenue NE Approval Date: 30 April 2008
Calgary, Alberta Issue Date: 30 April 2008

Canada T2E 6R7

Responsible Office: Prairie and Northern

Aircraft/Engine Type or Model: BELL 212

Registration/Serial No.: C-GALI/30525, C-FAHZ/30562, C-FAHL/30588,

C-GIRZ/30622, C-GAHV/30699, C-FAHR/30789, C-FAHB/30794, C-FALV/30816, C-FAHK/30852, C-FAHP/30933, C-GAHO/30937, C-FAHG/30940, C-FALK/30982, C-GRNR/30999, C-FAHC/31246

Canadian Type Certificate or Equivalent: H-86

Description of Type Design Change: Rappel Mount Provision and Cargo Deployment Arm

Installation/Operating Data,

Required Equipment and Limitations :

Configuration A - Rappel Mount Provision Only:

Installation of the Rappel Mount Provision to be completed in accordance with Transport Canada approved, AERO Design Ltd. Document Control List, DCL758-1, Revision 0, dated 30 April 2008, or later approved revision.

Transport Canada approved, AERO Design Ltd. Flight Manual Supplement FMS758.90, Revision 0, dated 07 April, 2008, or later approved revision is required with this installation.

Configuration B - Rappel Mount Provision with Cargo Deployment Arm:

Installation of the Rappel Mount Provision and Cargo Deployment Arm to be completed in accordance with Transport Canada approved, AERO Design Ltd. Document Control List, DCL758-1, Revision 0, dated 30 April 2008, and Transport Canada approved, AERO Design Ltd. Document Control List, DCL792-1, Revision 0, dated 30 April 2008, or later approved revisions.



Conditions: This approval is only applicable to the type/model of aeronautical product specified therein. Prior to incorporating this modification, the installer shall establish that the interrelationship between this change and any other modification(s) incorporated will not adversely affect the airworthiness of the modified product.

E. Burgoin, DAR 290M For Minister of Transport



TRANSFER REQUEST

INSTRUCTIONS

A transfer of ownership requires a prior approval from the Minister.

The reissue of the certificate in the name of the transferee will be contingent upon a demonstration made by the new owner that he can fulfill the responsibilities of an approval holder. Refer to AMA 513/5 for further details.

REQUEST FOR TRANSFER OF OWNERSHIP - LIMIT	TED SUPPLEMENTAL TYPE CERTIFICATE or REPAIR DESIGN CERTIFICATE
FROM (NAME AND ADDRESS ÒF HOLDER)	
TO (NAME AND ADDRESS OF TRANSFEREE)	
TRANSFER PARTICULARS (LICENSE AGREEMENT SALE OF RIGHTS, ETC.)	
DATE TRANSFER REQUIRED:	
	SIGNATURE
	(OF ORIGINAL OWNER)



(Continuation Sheet)

Number: C-LSH08-157/D Issue 1

NOTE: THIS ADDENDUM SHALL REMAIN PART OF THE CERTIFICATE REFERRED TO THEREIN.

Transport Canada approved, AERO Design Ltd. Flight Manual Supplement FMS758.90, Revision 0, dated 07 April, 2008, and Transport Canada approved, AERO Design Ltd. Flight Manual Supplement FMS792.90, Revision 0, dated 07 April, 2008, or later approved revision is required with this installation

Data Pertinent to All Configurations:

Transport Canada accepted, AERO Design Ltd. Instructions for Continued Airworthiness ICA758.90, Revision 0, dated 30 April, 2008, or later accepted revision is required with this installation.

Basis of Certification for installation is FAR 29 at amendment 29-2.

- End -

AERO DESIGN LTD. 2013 – 39 Avenue N.E., Calgary, Alberta, T2E 6R7

Tel: 403-250-8027 Fax: 403-250-8333 www.aerodesign.ca

28 April, 2008

Transport Canada Aircraft Certification Division 800-1601 Airport Road Calgary, Alberta T2E 6Z8

Attn: Greg Oucharek

Your File: C-08-0363

Our File: 758

Re: Extension of Deligation

Greg,

Please extend my delegation to include the following paragraphs listed on compliance program CP758.

29.865(a) External Loads 29.865(e) External Loads

Regards

E. Burgoih, P. Ing, DAR 290M

FORM AE-100

Aircraft Mfgr: Aircraft Model: Aircraft Model: C-FAHZ, C-FAHR, C-FAHZ, C-FAHR, C-GAHV, C-FAHR, C-FAHC, C-FA		Model Type Airplane Helicopter Appliance Component Component		AE-100 No.: Initial Issue Date: Revision: Revision Date: Approval No.: Delegation No.: Delegate Name: Classification of Designee: Employer:	AE758-1 29 April, 2008 0 C-LSH08-157/D 290M E. Burgoin AERO Design Ltd.		
		LI	ST OF APPROVED	REPO	RTS AND DATA		Compliance
Document	Number			Docum	ent Title		Compliance Status
							Compliance CP758-1 Rev 0 CP758-2 Rev 0
			DATA APPRO\	/ED BY	TRANSPORT CANADA		
FMS758 FMS792	Revision 0 Revision 0		nual Supplement nual Supplement				
DATA LISTED A	ABOVE AND OF SHED PROCES	N THE ATT. DURES AN	E BY THE DEPART ACHED SHEETS N D FOUND TO COM	UMBEF	ON OF TRANSPORT, I HEREBY C RED NII HAVE BEEN EXAM O THE BEST OF MY KNOWLE	INED II	N ACCORDANCE
I THEREFORE	.—.		D FOR APPROVAL HESE DATA	OF TH	E. Burgoin, DAR 290M	,	

AERO DESIGN LTD. 2013 – 39 Avenue N.E., Calgary, Alberta, T2E 6R7

Tel: 403-250-8027 Fax: 403-250-8333 www.aerodesign.ca

08 April, 2008

Transport Canada Aircraft Certification Division 800-1601 Airport Road Calgary, Alberta T2E 6Z8

Attn: Greg Oucharek

Your File:

Our File: 758

Re:

Installation of Rappel Mount Provision and Cargo Deployment Provision

Greg,

Please find attached the following documents related to this project:

Modification Approval Request Application Form	MOD758	Revision 0
Compliance Program	CP758	Revision 0
Project Summary	PS758	Revision 0
Alpine Helicopters Ltd. Fleet Information		

Regards,

E. Burgoin, P.Eng, DAR 290M

Encl.

758

-192

ALPINE HELICOPTERS LTD. FLEET INFORMATION

REGISTRATION	TYPE	S/N	DATE OF MANUFACTURE
C-GALI	BELL 212	30525	1971
C-FAHZ	BELL 212	30562	1973
C-FAHL	BELL 212	30588	1973
C-GIRZ ·	BELL 212	30622	1974
C-GAHV #	BELL 212	30699	1975
C-FAHR *	BELL 212	30789	1976
C-FAHB ~	BELL 212	30794	1976
C-FALV ~	BELL 212	30816	1976
C-FAHK	BELL 212	30852	1977
C-FAHP -	BELL 212	30933	1979
C-GAHO ~	BELL 212	30937	1979
C-FAHG -	BELL 212	30940	1979
C-FALK	BELL 212	30982	1980
C-GRNR	BELL 212	30999	1980
C-FAHC	BELL 212	31246	1983

	MODIFICATION APPROV	AL R	EQUEST AP	PLIC	ION F	ORM	MOD7	58, Rev. 0
1.	NAME AND ADDRESS OF APPLICANT:	2.	IDENTIFICATION	OF PRODUC	т			
	AERO Design Ltd. 2013 - 39 th AVE NE Calgary, AB T2E 6R7		MAKE: Bell			MODEL: 205A-1, 205B, 212, 412		
	ALL CORRESPONDANCE TO: AERO Design Ltd. 2013 39th Ave N.E. Calgary, AB T2E 6R7	s	RIAL No.: See Attached - A delicopters Ltd. F		RI	EGISTRATION See Attach Helicopters	ned - Alpii	
3.	REQUEST FOR:							
	A. SUPPLEMENTAL TYPE CERTIFICATE (STC)							
	B. STC/STA REVISION		STC/STA No.					
	C. LIMITED SUPPLEMENTAL TYPE CERTIFICATE (LSTC)	\boxtimes						
	D. LIMITED STC/STA REVISION		LSTC/LSTA No.					
	E. F.A.A. SUPPLEMENTAL TYPE CERTIFICATE							
	F. F.A.A. STC REVISION		STC No.					
	G. FAMILIARIZATION OF F.A.A. STC		STC No.					
	H. REPAIR DESIGN APPROVAL (RDC)							
	PARTS DESIGN APPROVAL (PDA)							
4.	TITLE OF MODIFICATION OR REPAIR: Installation of a rappel mount provision and cargo deployment pro	ovision.						
5.	BRIEF DESCRIPTION OF MODIFICATION OR REPAIR: The installation provides an aircraft mount for rappelling and carg	go deplo	yment operations by	trained pers	onnel (ie	. rappelling fire	e fighters).	
6.	APPLICABLE TYPE APPROVAL (TA) OR TYPE CERTIFICATE	E (TC) D	OCUMENTS:					
	A. TA NO. H-86 B. TC No. H1SW		C. OTHER					
7.	PROPOSED BASIS OF APPROVAL:							
	A. SAME AS TA ⊠ B. SAME AS TC □		C. OTHER	(Please s	pecify)			
8.				REQU	IRED	FOR	DOT USE	ONLY
	DOCUMENTATION CHECKLIST						RECEIVED)
				YES	NO	YES	NO	DATE
	COMPLIANCE PROGRAM			X				
	MASTER DRAWING LIST			X				
	FLIGHT MANUAL SUPPLEMENT MAINTENANCE MANUAL SUPPLEMENT			Х	V			
_	INSTRUCTIONS FOR CONTINUING AIRWORTHINESS			х	Х			
_	ENGINEERING REPORTS			X				
	DESIGN DRAWINGS			_^	х			
	MANUFACTURE DRAWINGS & INSTALLATION INSTRUCTION	NS		Х				
	ELECTRICAL LOAD ANALYSIS				X			
	DRAFT STC, LSTC OR RDA				Х			
	WEIGHT AND MOMENT CHANGE			Х		,		
	FLIGHT TEST DATA				Х			
	OTHER (Specify)				Х			
9.	APPLICANT'S REMARKS:							
10.	AERO Design Ltd.	alent, as a	nnadian Aviation Regula pplicable. For further d nsultant	ations (CAR) S details governii	Section 104 ng cost rec	, I agree to reim overy, refer to A	nburse Transp MA 513/4. 08 April, 2	
	PER: SUCANATURE OF ARRIVE ANTE	TITLI					DATE	
11.	SIGNATURE OF APPLICANTS	11111					DATE	
	SIGNATURE OF REGIONAL ENGINEER						DATE	



Project Summary

PS758, Revision 0, 08 April, 2008

Title: Rappelling Provisions

Cargo Deployment Provisions

Approval: LSTC

Manufacture: Mfd by Aero Design (amend Approved Producuct List)

Customer:

Type and Model: Bell models 205A-1, 205B, 212, and 412

Definition Of Change:

Description:

Provincial Forestries use Bell medium helicopters for initial response to fires. At the fire location there may not be suitable landing areas that can accommodate the helicopter within a reasonable distance.

Fire fighting personnel disembark the helicopter while it hovers by rappelling down lines suspended from anchor points on the helicopter. They make use of rappelling harnesses, ropes and braking devices designed specifically for this type of application in other non-aviation environments and built to accepted international standards.

Their equipment is slung out of the passenger compartment and lowered to the ground in a controlled manner on lines attached to the cargo.

A load-master, a permanent crew member of the helicopter coordinates and controls both the disembarkiment of personnel and the deployment of their equipement and cargo.

Both the rappel lines and the cargo deployment lines are released from the helicopter as soon as equipment or personnel are safely on the ground.

Primary Changes to the Aeronautical Product:

Installation of attachment provisions from which equipment can be lowered to the ground capable of supporting the maximum cargo load at ultimate maneuvering load.

Installation of attachment provisions for attaching rappel lines capable of supporting maximum personnel loads including any equipment they may be carrying.

Secondary Changes to the Aeronautical Product (Required as consequence of primary changes):

None

Other Relevant Modifications to the Aeronautical Product (Which impact on this change):

Project Summary

PS758, Revision 0, 08 April, 2008

Substantial Change Evaluation:

The scope of this change is not substantial.

Significant Change Evaluation:

_		
	Refer to AMA 500/16, Appendix A, Tables A.2.1 through A.5.6, as applicable.	
	Yes No No The change is an example on the table of Significant Changes. Yes No The change is close to an example on the table of Significant Cyes No The change is an example on the table of Not-Significant Changes No The change is close to an example on the table of Not-Signification Yes No The change is not an example on the tables.	changes. ges.
Α.	Is the general configuration changed? A change to the general configuration at the product level that is likely to require a new model designation because of the need to distinguish the different product with other product models (eg. performance, interchangeability of major components etc).	Yes □ No ⊠
В.	Are the principles of construction changed? A change at the product level to the materials and/or construction methods that affects the overall product's operating characteristics or inherent strength.	Yes ☐ No ⊠
C.	Have the assumptions used for certification been invalidated? Changes to product level assumptions, either design or engineering, associated with product development, compliance demonstration, performance or operating envelope that by themselves are so different, that the original assumptions are invalidated and the existing substantiation cannot be extrapolated to cover the changed product.	Yes □ No ⊠
Bas	sis of Certification of the Basic Aeronautical Product: Type Certificate Data Sheet: H1SW	
Bas	sis of Certification for the Change to the Aeronautical Product:	
	Same as the original basis of certification on the Type Certificate Data Sheet.	
liste not	der the authority vested in me by the Minister, I have examined the change is above according to the established procedures and hereby determine significant pursuant to subsection 511.13(3) or 513.07(3) of the CARS, to the the complete subsection 511.13(3) or 513.07(3) of the CARS, to the complete subsection 511.13(3) or 513.07(3) of the CARS, to the complete subsection 511.13(3) or 513.07(3) of the CARS, to the complete subsection 511.13(3) or 513.07(3) of the CARS, to the complete subsection 511.13(3) or 513.07(3) of the CARS, to the complete subsection 511.13(3) or 513.07(3) of the CARS, to the complete subsection 511.13(3) or 513.07(3) of the CARS, to the complete subsection 511.13(3) or 513.07(3) of the CARS, to the complete subsection 513.07(3) or 513.07(3	ne that it is
	LD B	08 April, 2008
E. E	Burgoin, P. Eng., DAR 290M	Date

AIRWORTHINESS REQUIREMENTS **COMPLIANCE PROGRAM**

Page 1 of 2

CP758-01

APPLICANT: AERO Design Ltd.

2013 - 39th Ave N.E.

Calgary, Alberta

T2E 6R7

T2E 6R7

MAKE: Bell

REV. No. 0

MODEL: 205A-1, 205B, 212, and 412

DATE: 01 October 2007

CORRESPONDANCE TO: AERO Design Ltd. (If other than applicant) 2013 - 39th Ave N.E.

Calgary, Alberta

REGISTRATION: SERIAL No.:

NATURE OF WORK: Cargo deployment from hover - Forestry applications

MODEL CERTIFICATION BASIS: FAR 29, Amendment 2 and CAR 7 Amendment 4 for 205A-1 and 205B MODIFICATION CERTIFICATION BASIS: FAR 29, Amendment 2 and Amend 29-43 for 29.865(a) and 29.865(e)

Airworthiness Requirement	Subject for Compliance or Documentary Proof	Form of Substantiation	DOT	DAR	Comments
	Subpart B - Flight				
29.29	Empty weight and CofG	Installation weight and moment on drawings		Х	
	Subpart C – Strength Requirements				
29.301	Loads	Analysis		Х	
29.303	Factor of safety	Analysis		X	
29.305	Strength and deformation	Analysis		X	
29.307(a)	Proof of structure	Analysis		X	
29.309(a)	Design limitations – design maximum weight	Limitation		Χ	Design max weight for this piece of equipment only
29.309(d)	Design limitations – maximum rearward and sideward flight speeds	Limitation		х	Speed limitations for deployment phase of flight only.
29.337(a)	Limit maneuvering load factor	Analysis		Χ	,.
29.341	Gust loads	N/A			Loads only applied in hover phase of flight
29.351	Yawing conditions	N/A			Loads only applied in hover phase of flight
29.561	Emergency Landing Conditions	N/A			
	Subpart D – Design and Construction				
29.601	Design	Statement		Х	
29.603	Materials	Design		Χ	

AIRWORTHINESS REQUIREMENTS COMPLIANCE PROGRAM

Airworthiness Requirement	Subject for Compliance or Documentary Proof	Form of Substantiation	DOT	DAR	Comments
29.605	Fabrication methods	Design	201	X	No processes that require close control being
					applied in the design.
29.609	Protection of Structure	Specifications on drawings		Х	
9.611	Inspection provisions	Design		Х	
29.613	Material strength properties and design values	Use of materials listed in Mil-Hdbk 5		X	
29.619	Special factors	Compliance with 29.623 and 29.625		X	
29.623	Bearing Factors	Analysis		X	
29.625	Fitting Factors	Analysis		Х	
29.785(a)	Seats, births, litters, safety belts, and harnesses.	Analysis		Х	
29.785(e)	Seats, births, litters, safety belts, and harnesses.	Analysis		X	
29.865(a)	External Loads	Analysis		Х	Limitation: Rappel operations while helicopter in hover only.
29.865(e)	External Loads	Flight Manual Supplement	X		in novel only.
	Subpart F – Equipment				
29.1301	Function and installation	Design		X	
	Subpart G – Limitations				
29.1501	Operating limitations – General	Provision of Flight Manual Supplement (FMS) Placards	X		
29.1503	Airspeed limitations	Limitation in FMS	X		Limitation to hover and low translational speeds during deployment phase
29.1523	Minimum crew	Limitation in FMS	X		Load-master shall be on-board in addition to pilot
29.1525	Kinds of operation	Limitation in FMS	X		Allows deployment Restricts rotorcraft occupants to crew membe and others essential to the operation.
29.1529	Instructions for Continued Airworthiness	ICA Provided	X		and others essential to the operation.
29.1541	Markings and placards	Placards on drawings - weight limitation for deployment		X	
29.1581 29.1583	Rotorcraft Flight Manual FMS Operating Limitations	Provision of Imitations in FMS Provision of limitations in FMS	×		
29.1585	FMS Operating Procedures	Provision of normal and emergency	X		
29.1587	FMS Performance	procedures in FMS N/A			No change from Type Approval
29.1307	I WIG I CHOITHAILCE	TM//			140 change nom Type Approval

CP758-02

APPLICANT: AERO Design Ltd.

2013 - 39th Ave N.E.

REV. No. 0

Calgary, Alberta

T2E 6R7

MAKE: Bell

CORRESPONDANCE TO: AERO Design Ltd.

MODEL: 205A-1, 205B, 212, and 412

DATE: 01 October 2007

(If other than applicant) 2013 - 39th Ave N.E.

REGISTRATION:

Calgary, Alberta T2E 6R7

SERIAL No.:

NATURE OF WORK: Rappel Anchor Provision - Forestry applications

MODEL CERTIFICATION BASIS: FAR 29, Amendment 2 and CAR 7 Amendment 4 for 205A-1 and 205B MODIFICATION CERTIFICATION BASIS: FAR 29, Amendment 2 and Amend 29-43 for 29.865(a) and 29.865(e)

Airworthiness Requirement	Subject for Compliance or Documentary Proof	Form of Substantiation	DOT	DAR	Comments
	Subpart B - Flight				
29.29	Empty weight and CofG	Installation weight and moment on drawings		X	
	Subpart C - Strength Requirements				
29.301	Loads	Analysis		Х	215 lb. 95 percentile person plus equipment load
29.303 29.305 29.307(a)	Factor of safety Strength and deformation Proof of structure	Analysis Analysis Analysis		X X X	, iodd
29.309(a)	Design limitations – design maximum weight	Limitation		Х	Design max weight for this piece of equipment only
29.309(d) 29.337(a) 29.341 29.351 29.561	Design limitations – maximum rearward and sideward flight speeds Limit maneuvering load factor Gust loads Yawing conditions Emergency Landing Conditions	Limitation Analysis N/A N/A N/A		x x	Speed limitations for rappelling phase of flight only. Loads only applied in hover phase of flight Loads only applied in hover phase of flight
	Subpart D – Design and Construction				
29.601 29.603	Design Materials	Statement Design		×	

Airworthiness Requirement	Subject for Compliance or Documentary Proof	Form of Substantiation	DOT	DAR	Comments
29.605	Fabrication methods	Design		Х	No processes that require close control being applied in the design.
29.609	Protection of Structure	Specifications on drawings		X	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
29.611	Inspection provisions	Design		X	
29.613	Material strength properties and design values	Use of materials listed in Mil-Hdbk 5		X	
29.619 29.623	Special factors Bearing Factors	Compliance with 29.623 and 29.625 Analysis		X	
9.625	Fitting Factors	Analysis		x	
9.785(a)	Seats, births, litters, safety belts, and harnesses.	Analysis		X	
29.785(e)	Seats, births, litters, safety belts, and harnesses.	Analysis		Х	
29.865(a)	External Loads	Analysis		X	Limitation: Rappel operations while helicopter in hover only.
29.865(e)	External Loads	Flight Manual Supplement	Χ		in novel only.
	Subpart F – Equipment				
29.1301	Function and installation	Design		X	
	Subpart G – Limitations				
		Provision of Flight Manual	.,		
29.1501	Operating limitations – General	Supplement (FMS) Placards	Х		
29.1503	Airspeed limitations	Limitation in FMS	X		Limitation to hover during rappel phase
9.1523	Minimum crew	Limitation in FMS	Х		Load-master shall be on-board in addition to pilot
9.1525	Kinds of operation	Limitation in FMS	Х		Allows rappelling Restricts rotorcraft occupants to crew membe and others essential to the operation.
9.1529	Instructions for Continued Airworthiness	ICA Provided Placards on drawings	Χ		and outlore decention to the operation.
9.1541	Markings and placards	- weight limitation for rappelling anchor		X	
29.1581	Rotorcraft Flight Manual	Provision of FMS	X		
9.1583	FMS Operating Limitations	Provision of limitations in FMS	X		
9.1585	FMS Operating Procedures	Provision of normal and emergency procedures in FMS	X		
29.1587	FMS Performance	N/A			No change from Type Approval

	MC ICATION APPROV	/AL R	EQUEST AF	PLICA1	FO	ORM	MOD7	'5B, Rev. (
1. NAME AND ADDRESS OF APPLICANT:			IDENTIFICATION	OF PRODU	ICT						
AERO Design Ltd. 2013 - 39 th AVE NE Calgary, AB T2E 6R7			KE: Jell		MODEL: 205A-1, 205B, 212, 412						
AERO Design L 2013 39th Ave N	ALL CORRESPONDANCE TO: AERO Design Ltd. 2013 39th Ave N.E. Calgary, AB T2E 6R7			SERIAL No.: See Attached - Alpine Helicopters Ltd. Fleet Info				REGISTRATION: See Attached - Alpine Helicopters Ltd. Fleet Info			
3. REQUEST FOR:	T-10			-				-			
A. SUPPLEMEN	TAL TYPE CERTIFICATE (STC)										
B. STC/STARE	VISION		STC/STA No.								
C. LIMITED SUI	PPLEMENTAL TYPE CERTIFICATE (LSTC)										
D. LIMITED STO	C/STA REVISION		LSTC/LSTA No								
E. F.A.A. SUPP	LEMENTAL TYPE CERTIFICATE										
F. F.A.A. STOR	ÉVISION		STC No.								
G. FAMILIARIZA	ATION OF F.A.A., STC		STC No.								
	IGN APPROVAL (RDC)		- TO 110.								
	GN APPROVAL (PDA)										
		Ц	***								
	CATION OR REPAIR: ppel mount provision and cargo deployment pro	ovislon.									
	ION OF MODIFICATION OR REPAIR: wides an aircraft mount for rappoliting and carr	to deploy	meni operations by	y trained per	sonnel (le.	rappelling fir	e fighters).				
6. APPLICABLE TYP	E APPROVAL (TA) OR TYPE CERTIFICATE	E (10) D	OCUMENTS:								
A. TA NO. H-86	B, TC No. H1SW	1	C. OTHER		_						
7. PROPOSED BASI	S OF APPROVAL:				-						
A. SAME AS TA	B. SAME ASTC	¢	C. OTHER	(Please :	specify)						
8.	e. Documentation Checklist			REQUIRE			D FOR DOT USE ONLY				
				YES		RECEIVED					
COMPLIANCE PR	OGRAM		4	X	NO	YES	NO	DATE			
MASTER DRAWN	IG LIST			X		-	-				
FLIGHT MANUAL	SUPPLEMENT			х							
MAINTENANCE M	ANUAL SUPPLEMENT				X						
INSTRUCTIONS F	OR CONTINUING AIRWORTHINESS			х		,					
ENGINEERING RE	ENGINEERING REPORTS										
DESIGN DRAWING					X						
	RAWINGS & INSTALLATION INSTRUCTION	S		×							
DEAET STOLLOW					Х						
DRAFT STC, LSTC					Х						
FLIGHT TEST DAT				Х							
OTHER (Specify)					X						
8. APPLICANT'S RE	MARKS;				^	L					
19. In addition to the pay- incremental expenses	nent of Aircraft Contitontion approved fees es préscrit as in Avistion Régulation Directive No. 3, si aquivair	bed in Car	nadian Aviadan Reguis	dions (CAR) s	eolion 104, I	edies to lejui	burse Trensp	ort Canada			
AERO Desig	Ltd.			ачана Маления	ng Coet FBC00	ery, rater to Al		***			
MIGNA TURE OR APPLE	The Table of The Constitution of the Constitut						08 April, Zi	008			
91GMATISHE OF REGIS	DIAN FAIRER					700	DATE	79			
Formy MOD, 25 Merch, 200				, , ,							



1100-9700 Jasper Avenue Edmonton, Alberta T5J 4E6 Your file Votre reference

Our file Notre reference

C-08-0363 5010-0402

May 5, 2008

AERO Design Limited 2013 39 Ave. NE Calgary, AB T2E 6R7

SUBJECT: Extension of DAR 290M Authority – Bell 212, 412 and 205 series rotorcraft, Installation of Rappel and Cargo Deployment Provisions, C-LSH08-157/D

This is in response to your April 28, 2008 request for extension of delegation to cover the subject design change. You are hereby authorized to make findings of compliance for the following Airworthiness Standard as listed in Compliance Plan CP758:

29.865(a) and (e) External Loads

This is a one-time extension, granted in accordance with Airworthiness Manual, Chapter 505.223(a) and is limited to be exercised for this approval only. Approval number C-LSH08-157/D has been assigned for your use.

If you have any questions or wish to discuss this project further, please contact the project OPI, Greg Oucharek at the Calgary TCC.

Yours truly

F.J.B. Wright

Regional Manager Aircraft Certification

Prairie and Northern Region Phone: (780) 495-3856

Fax: (780) 495-7963